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Monitoring Well Construction and Groundwater Quality Analysis at the U.S. Army Reserve Center Complex and Training Area-84th Division

Milwaukee, Wisconsin

Contract No. DACA45-87-D-0075

Project No. HA01005-8P

March 1989

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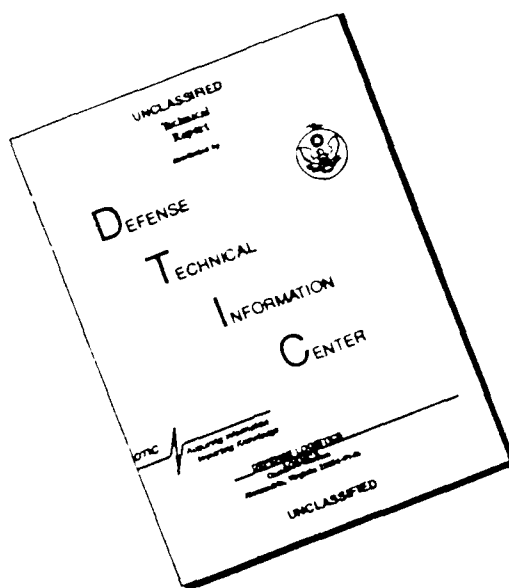
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Donohue

March 29, 1989

Commander Fort McCoy
AFZR-DE-E
Sparta, WI 54656

Attn: Colonel Westenburg
Director of Directorate of Engineering

Re: Monitoring Well Construction and Groundwater Quality Analysis
US Army Reserve Center (U.S.A.R.C.) Complex and Training Area
Milwaukee, Wisconsin
Donohue Project No. 15977.007

Dear Colonel Westenburg:

Donohue & Associates is pleased to submit to your attention ten (10) copies of our final report entitled "Monitoring Well Construction and Groundwater Quality Analysis at the U.S. Army Reserve Center Complex and Training Area-84th Division, Milwaukee, Wisconsin" (March, 1989). This work was performed under Contract No. DACA45-87-D-0075, Project No. HA01005-8P.

The attached report discusses geologic, hydrogeologic and water quality information obtained during this (and other) investigations conducted at the U.S.A.R.C. Complex. Results of this study indicate that groundwater quality has been impacted at several monitoring locations across the U.S.A.R.C. site by selected indicator, public health and public welfare parameters, including volatile organic compounds. However, the hydrogeologic information obtained during this investigation indicates that the observed impact has resulted from off-site sources located northeast (upgradient) of the U.S.A.R.C. site.

Please feel free to contact Donohue should you have any questions or comments regarding this report.

Very truly yours,

DONOHUE & ASSOCIATES, INC.

James W. Retzlaff ^{SR}

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MONITORING WELL CONSTRUCTION
AND GROUNDWATER QUALITY ANALYSIS

AT THE

U.S. ARMY RESERVE CENTER COMPLEX AND TRAINING AREA
84TH DIVISION
MILWAUKEE, WISCONSIN

Contract No. DACA45-87-D-0075
Project No. HA01005-8P

March, 1989

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Donohue & Associates, Inc.
4538 North 40th Street
Sheboygan, WI 53083

Project No. 15977.007



I *David S. Vought* certify that I
am a hydrogeologist and meet or exceed
the requirements of NR.500.03(64) of the
Wisconsin Administrative Code.

I *Jacques R. Girard* certify that I
am a hydrogeologist and meet or exceed
the requirements of NR.500.03(64) of
the Wisconsin Administrative Code.

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Attachment

- 1 Department of Army Request for Proposal and Scope of Services

APPENDICES

Appendix

- A Donohue Boring Logs
- B Twin City Testing Boring Logs
- C Donohue Well Construction Diagrams
- D Twin City Testing Well Construction Diagrams
- E Well Development Forms
- F Groundwater Sampling Results
- G Wisconsin DNR Groundwater Monitoring Well Installation Form

RP/USARMYM/AA5

1.0 INTRODUCTION

During September, 1988, Donohue & Associates, Inc., received by authorization from the U.S. Department of the Army to proceed on Open-End Contract No. DACA45-87-D-0075 for Monitoring Well Construction and Groundwater Analysis, Milwaukee, Wisconsin (Project No. HA01005-8P). This project was completed in accordance with the Scope of Services presented in the August (1988) U.S. Army Request for Proposal (RFP), except for those deviations noted elsewhere in this report. For reference, a copy of the RFP has been included in this report (Attachment 1). All work activities associated with this project were conducted under the jurisdiction of the Commander, Fort McCoy, Wisconsin.

The purpose of this field investigation was to determine the geologic and hydrogeologic characteristics at the U.S. Army Reserve Center Complex and Training Center (U.S.A.R.C.) in Milwaukee, and to assess current groundwater quality at this site. These objectives were accomplished by (1) reviewing existing monitoring data compiled from previous investigations conducted at the U.S.A.R.C.; (2) installing additional groundwater monitoring wells; (3) collecting bimonthly water elevation data; and (4) performing two monthly groundwater sampling events.

This report presents our project approach, regional and site-specific information obtained during this and earlier investigations, and provides the Department of the Army with information pertaining to groundwater quality. This includes documentation of well construction methods and groundwater sampling protocols employed during this investigation. In addition, historic hydrogeologic and water chemistry data has been compiled to determine whether groundwater contamination currently exists at this site, and to assess the extent of any observed contamination.

1.1 General Location and Topography

The U.S.A.R.C. study area is located between North 48th and North 55th Streets in the City of Milwaukee (Figure 1). This property lies adjacent to, and directly north of, West Silver Spring Drive. The U.S.A.R.C. is bounded on the northeast by the Chicago, Milwaukee, St. Paul, and Pacific Railroad right-of-way.

Surface topography at the site is represented by nearly level, to very gently rolling terrain with a maximum 25-foot difference in relief (Figure 2). The lowest elevation (approximately 670 feet above mean sea level) occurs at Lincoln Creek in the southwestern portion of the study area. The highest elevations (approximately 695 feet above mean sea level) are in the northernmost part of the U.S.A.R.C., and along the northeast boundary of the study area. Surface slope is directed towards the southwest.

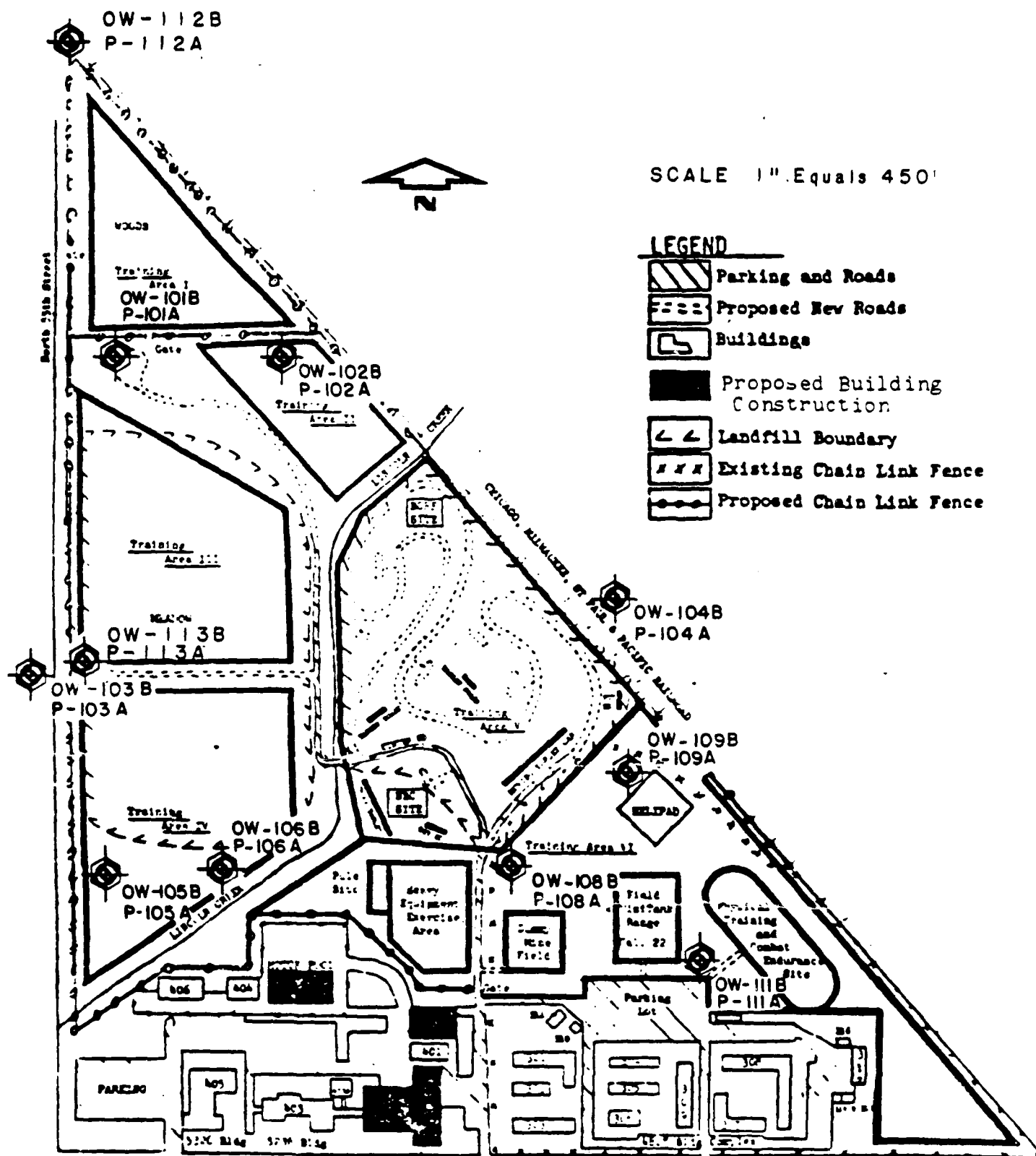
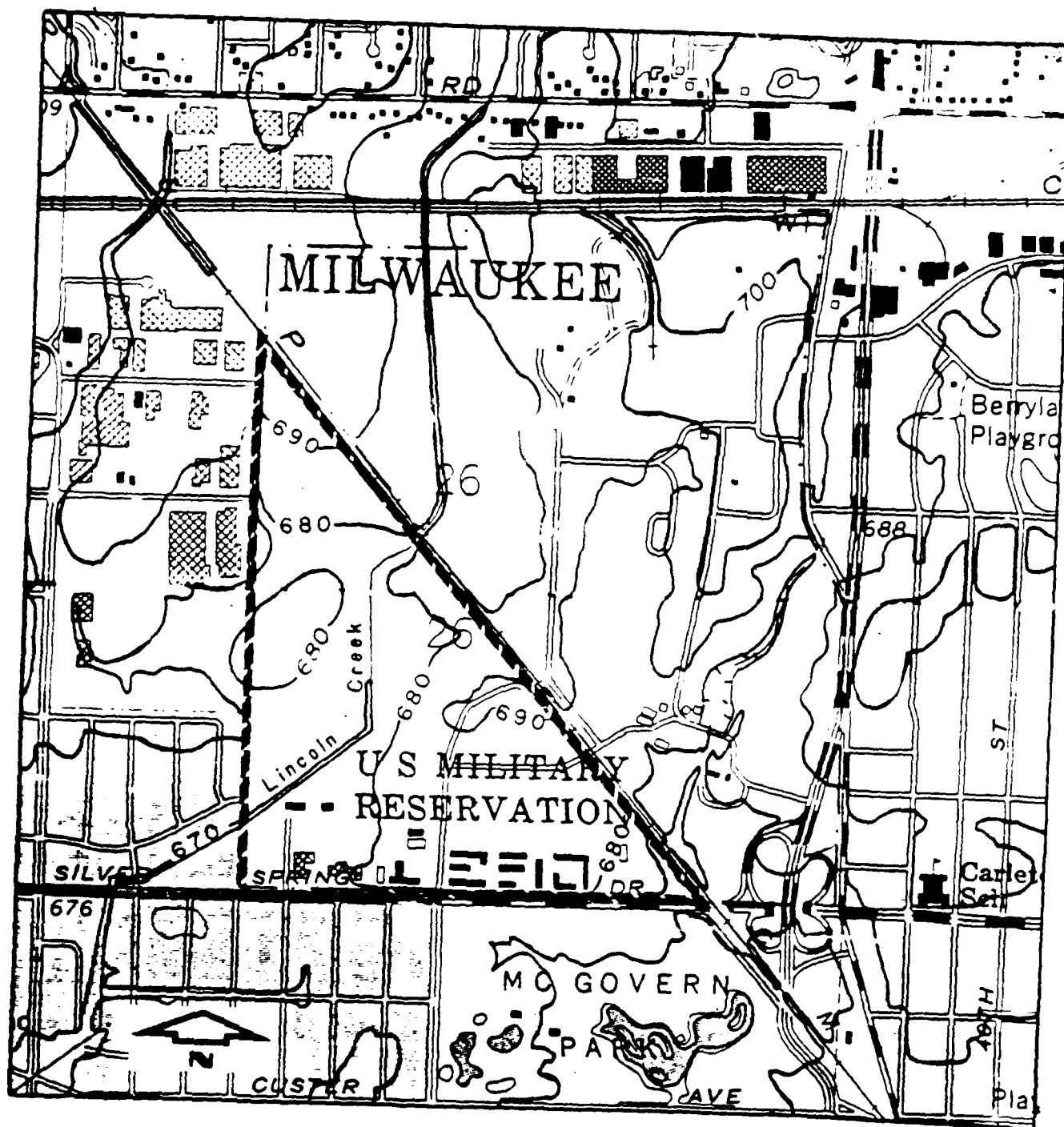


FIGURE 1
LOCATION OF WELLS
MILWAUKEE U.S.A.R. CENTER
COMPLEX AND TRAINING AREA
MILWAUKEE, WISCONSIN
DONOHUE & ASSOCIATES
1989



Scale
1" Equals 1000'

Legend

— 800 — Surface Contour
Elev. (Ft.)
Datum (M.S.L.)

FIGURE 2
TOPOGRAPHIC MAP
MILWAUKEE U.S.A.R. CENTER
COMPLEX AND TRAINING AREA
MILWAUKEE, WISCONSIN
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Lincoln Creek bisects the western portion of the U.S.A.R.C., flowing southward across the study area. Surface water drainage across the site is directed to the south-southwest towards Lincoln Creek. Lincoln Creek originates approximately 2 miles northwest of the U.S.A.R.C. complex, and discharges into the Milwaukee River, approximately 2.5 miles southeast of the study area. The southwest portion of the U.S.A.R.C. complex is located within the Lincoln Creek 100-year floodplain.

1.2 Present and Prior Land Uses

The U.S.A.R.C. is comprised of several administrative/maintenance buildings located on approximately 60 acres (Figure 1). The complex includes military reserve buildings, a motor repair shop, paved roadways, parking areas, and sidewalks. The entire facility is fenced, and access onto the site is restricted.

Adjacent land use consists of mixed light-commercial and residential areas north of the U.S.A.R.C.; the Chicago, Milwaukee, St. Paul and Pacific Railroad right-of-way and the Havenwoods Nature Center on the east; residential and recreational (McGovern Park) areas to the south; and residential and light-commercial use along 55th Street, and areas further west (Figure 2).

Prior land use information presented within the "Environmental Assessment and Finding of No Significant Impact Report" prepared in 1984 indicates that landfilling operations occurred at the U.S.A.R.C. between 1957 through 1966. Reportedly, the Milwaukee Sanitation Department disposed of approximately 500,000 cubic yards of solid waste at this site. This included furniture, appliances, street sweepings, leaves, tin cans, bottles, ashes, cinder and sewer pipe. No newspaper, garbage, industrial or hazardous waste was accepted. During landfilling operations, earth berms were constructed to minimize the flow of potential contaminants to Lincoln Creek.

Samples of seepage discharge collected by the Wisconsin DNR in 1983 indicated that the discharge did not contain pollution concentrations that would be detrimental to public health, wildlife, fish, or aquatic life. Samples of Lincoln Creek collected by the DNR in 1983 at stations located upstream and downstream of the landfill cells also indicated no contamination (Department of the Army, 1984).

1.3 Background Information

Geologic, hydrogeologic and water quality information obtained during previous studies conducted by Donohue and Foth & Van Dyke at the U.S.A.R.C. has been reviewed and is summarized in the following section of this report.

Donohue, 1985

In 1984, Donohue was retained by the U.S. Army Corps of Engineers (Omaha) to define site geology and hydrogeology, and to determine the potential impact the landfill exerted on soil and groundwater quality. This was accomplished by installing eighteen nested groundwater monitoring wells at nine locations across the site, and initiating a groundwater sampling program. The results of this investigation are summarized in a report entitled, "Landfill Impact Evaluation, USAR Center Complex and Training Area" (April, 1985).

Boring information obtained by Donohue in 1985, demonstrated that a bedrock "high" occurs in the southeast portion of the site (27-foot depth). Bedrock is overlain by unconsolidated glacial drift. Lithologically, the drift is comprised of clayey-silt, silty-sand, and sand and gravel layers.

Water level information obtained in the 1985 Donohue study suggested that a water table "high" was located in the south-central portion of the site at that time. Local groundwater flow in the area of the mound was expected to be directed laterally (and downward) towards the east, west, and north. Groundwater movement in other areas of the study area were anticipated to be directed primarily towards the south and southwest. Groundwater gradients obtained during this study indicate that groundwater recharge occurring across the site moves within the shallow water table system, discharging into Lincoln Creek.

Groundwater and surface water chemistry data obtained during this earlier study indicated that higher than expected concentrations of chloride, sulfate, Total Dissolved Solids, and hardness occurred in selected wells. Although the concentration of compounds observed indicated that potential impact from the landfill may have occurred, it was also possible that the contaminants observed were derived from off-site, (upgradient) sources. These possibilities could not be fully-addressed due to the design of the monitoring program in place at that time.

Foth & Van Dyke, 1988

A second study discussing landfill cap design, site hydrogeology, and groundwater quality data was conducted at the U.S.A.R.C. by Foth & Van Dyke and Associates. The results of this investigation have been summarized in a report entitled, "Landfill Sampling and Analyses, U.S.A.R.C., West Silver Spring Drive, Milwaukee, Wisconsin (February, 1988)". During February 1987, eighty-seven auger borings were drilled at 200-foot intervals through the landfill cap to document clay content and cap thickness. This study revealed that approximately 75 percent of the

landfill site had been capped by less than 2 feet of clay. This indicates that a large portion of the site does not satisfy landfill closure requirements as stipulated in the Wisconsin Administrative Code.

A water table map for this site was prepared by Foth & Van Dyke using water elevation data obtained September 28, 1987. This information indicated that a water table "high" was located in the south-central portion of the study area. Local groundwater flow near the water table mound was shown as being directed towards the northeast and west, while groundwater movement in other areas of the site is to the west and southwest. These results are comparable with those presented in the 1985 Donohue report.

Water quality data obtained by Foth & Van Dyke indicate that surface water and groundwater at the site were impacted at that time. Five wells exceeded the Wisconsin DNR Preventative Action Limit (PAL) for vinyl chloride. Four wells containing this contaminant were located upgradient (north) of the site. Other organic constituents detected, but which did not exceed the PAL, were 1,1 dichloroethane (upgradient), 1,2 dichloroethylene (upgradient), trichloroethylene (upgradient), tetrachloroethylene (downgradient), and toluene (downgradient). Chloroform and dichlorobromomethane were observed in surface water samples collected from Lincoln Creek (upstream, downstream).

Inorganic analytes detected in groundwater samples collected by Foth & Van Dyke, which exceeded the established PAL, included chloride, arsenic, cadmium, iron, and sulfate. High chloride and iron concentrations were observed in upgradient wells suggesting an off-site source. Sulfate exceedances were observed in many locations across the study area.

The water quality information given in the Foth & Van Dyke study indicated that the groundwater at the site had been impacted. Foth & Van Dyke staff also concluded that a source other than the landfill may be responsible for the vinyl chloride observed in the groundwater. It was recommended that additional wells be installed to further define hydrogeologic characteristics of this site, and to obtain additional information necessary to assess whether the observed groundwater contamination was due to off-site sources.

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2.0 PROJECT APPROACH

The previous groundwater investigation conducted by Foth & Van Dyke has demonstrated that volatile organics and other indicator parameters (including vinyl chloride) were present in some of the monitoring wells located upgradient of the landfill area. The current expanded monitoring well installation and groundwater sampling program conducted at the USARC by Donohue was performed to obtain additional hydrogeologic and water chemistry information. This information has been used to define the aerial extent of any observed contamination, and to determine whether the contaminants are derived from on-site or off-site sources.

2.1 Scope of Services

Donohue satisfied the above objectives by completing the following Scope of Services:

1. Background information obtained by Donohue (1985) and Foth & Van Dyke (1988) was reviewed to determine prior site history, and to provide information useful for the completion of this project.
2. Donohue prepared a site-specific workplan (November 1988) specifying well construction and groundwater sampling protocols, data quality objectives, and health and safety procedures.
3. Donohue prepared technical specifications for soil boring, well construction and other related activities, and entered into an agreement with Twin City Testing Corporation (Wausau, Wisconsin).
4. Two well nests, each consisting of a water table observation well and an adjacent piezometer, were constructed of 2-inch, flush-joint stainless steel riser and screen at locations determined by the Department of the Army.
5. Two rounds of water quality sampling for volatile organics were performed (GC/MS) for each new well, as well as selected pre-existing wells. The wells sampled during December, 1988, and January, 1989, included:

| | |
|----------------|----------------------------|
| P-101A/OW-101B | P-106A/OW-106B |
| P-102A/OW-102B | P-112A/OW-112B (new wells) |
| P-105A/OW-105B | P-113A/OW-113B (new wells) |

6. Groundwater samples collected from each newly-installed well during December, 1988, and January, 1989, were also analyzed for the following:

- a. Field parameters including temperature, pH, color, odor, turbidity, and specific conductance.
 - b. Dissolved metals including iron, barium, chromium, mercury, lead, cadmium, and arsenic.
 - c. Indicator parameters including COD, BOD, hardness, odor alkalinity, nitrogen (plus nitrate), chloride, sulfate, and boron.
7. Water level measurements were collected bimonthly from each of the above wells during December, 1988, and January, 1989.
 8. All wells were surveyed, referencing their vertical and horizontal locations to a USGS bench mark (or the Wisconsin State Plane Coordinate System).
 9. Donohue completed Wisconsin DNR Well Installation Forms documenting well construction details.

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3.0 REGIONAL GEOLOGY AND HYDROGEOLOGY

3.1 Stratigraphy

The U.S. Army Reserve Center Complex and Training Area is underlain by soils which have been disturbed in many areas due to landfilling and other site development activities. On-soils have been assigned to the Loamy Land, Ashkum, Clayey Land, Mequon, and Ozaukee Soil Series.

Variable thickness of Wisconsinan-Age glacial drift underlie the surficial soil. Two till units have been mapped by the Wisconsin Geologic and Natural History Survey across the region. The uppermost sequence of fine-grained till, lacustrine clay, silt and sand, and glaciofluvial sand and gravel deposits have been assigned to the Oak Creek Till. This unit is underlain by noticeably coarser till deposits, comprised predominantly of silty and clayey sands and gravels (New Berlin Till). The glacial drift is unconformably underlain by the Niagara Dolomite of Silurian age.

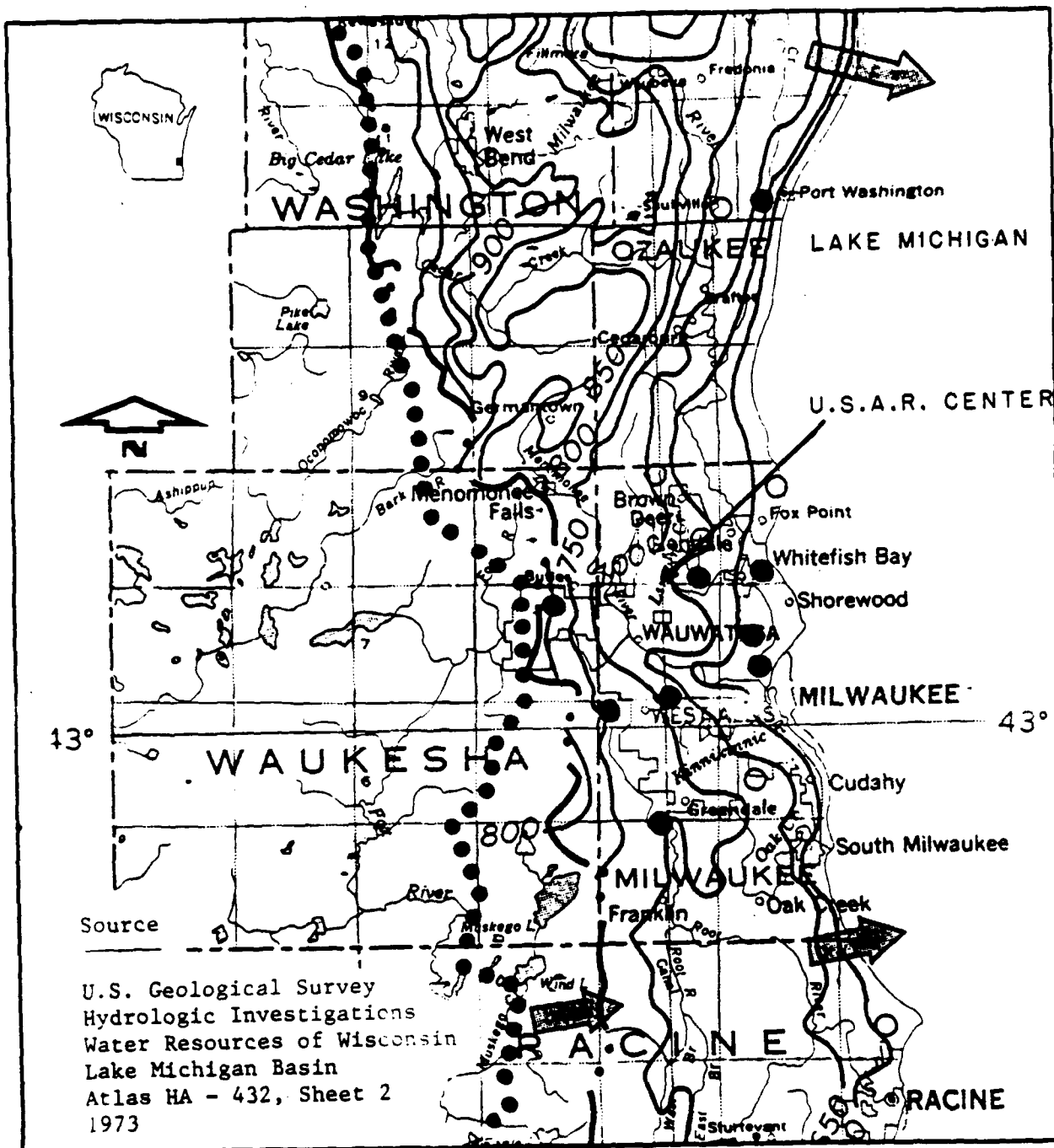
3.2 Hydrogeology

Published hydrogeologic information has documented the existence of two main aquifers units in Milwaukee County. Throughout much of the region, the shallow water table (unconfined) aquifer is comprised of the unconsolidated glacial drift unit, which is hydraulically connected with the underlying Niagara Dolomite. Lithologic differences in the drift unit may locally inhibit hydraulic connection between these two hydrologic units. Generally, small to moderate groundwater supplies are obtained from the water table aquifer. Well yields are dependant on grain size, sorting, and the saturated thickness of sediment comprising the glacial unit, and the presence of fractures, joints, solution channels in the Niagara.

Recharge to the unconfined drift and Niagara aquifer system results primarily from downward seepage of precipitation. Locally, the groundwater discharges to wells, streams, lakes, wetlands, and Lake Michigan.

The deep, confined Cambro-Ordovician sandstone aquifer is the dominant source of groundwater for Milwaukee County. Moderate to large quantities of good quality water are obtained from this aquifer. Wells fully-penetrating this aquifer are capable of producing from 1000-2000 gallons per minute. Well yields are affected by the thickness of aquifer penetrated, and the amount of permeability and porosity development.

Figure 3 is a regional water table map which shows water table elevation data, and general groundwater flow direction in the unconfined drift and Niagara aquifer system in the vicinity of



Scale

1" Equals 8 Miles

Legend

- Groundwater Divide
- 700— Water Table Contour
- ➔ Groundwater Flow Direction
- Observation Wells

FIGURE 3
REGIONAL WATER TABLE MAP
MILWAUKEE U.S.A.R. CENTER
COMPLEX AND TRAINING AREA
MILWAUKEE, WISCONSIN
DONOHUE & ASSOCIATES
1989

the U.S.A.R.C. Since groundwater flow in the water table system (indicated by arrows) is from areas of high hydraulic head to areas of lower head, groundwater movement appears to be directed primarily towards the east and southeast. Local groundwater flow within the water table system is anticipated to be interconnected with Lincoln Creek which flows south of the site. Groundwater movement within the deep, confined aquifer system is directed eastward, towards Lake Michigan.

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4.0 SUBSURFACE FIELD INVESTIGATION

The various work tasks comprising this program were generally completed in accordance with the site-specific workplan prepared by Donohue entitled, "Monitoring Well Installation and Groundwater Sampling and Analysis Plan (November 1988)". Health and Safety procedures and technical specifications used during this project have been included in the project workplan.

4.1 Well Locations

Two well nests, each comprised of an observation well and an adjacent piezometer, were installed from November 14-28, 1988, at the U.S.A.R.C. to obtain additional hydrogeologic and water quality data. The general locations of wells OW-112B/P-112A, and OW-113B/P-113A were determined by the Department of the Army prior to initiation of the well installation program.

As shown in Figure 1, well nest OW-112B/P-112A was installed approximately 5 feet outside the extreme northern limit of the U.S.A.R.C. complex. Installation of wells within the fenced area was not possible because the area was heavily wooded, and would have required the removal of several trees, brush, or a portion of the fence. To preclude such activities, the Department of the Army located the well nest just north of the fenced area. To reduce the potential for vandalism, each well at this location was constructed with locked, protective casings and flushed-mounted covers. Well nest OW-113B/P-113A was installed on U.S.A.R.C. property, approximately 30 feet east of the Reserve Center fence, and east of the driveway (trail) located immediately along the fence.

4.2 Well Installation Procedures

Borings were drilled in the unconsolidated surficial deposits using a 4 1/4-inch I.D. hollow stem auger. Standard split spoon samples were taken at 5-foot depth intervals. Soil boring, soil sampling and well construction activities were continuously monitored by a Donohue geologist or hydrogeologist. Continuous monitoring of air quality in the vicinity of each borehole was performed as drilling proceeded. Boring logs prepared by Donohue and Twin City Testing are included in Appendices A and B respectively. Well construction diagrams appear in Appendices C and D.

Historic well construction information pertaining to all wells installed at this site has been summarized in Table 1. Well construction information for each newly-installed well is summarized on a Wisconsin DNR Groundwater Monitoring Well Installation Form, Form 4400-89 (Appendix G).

TABLE 1
WELL CONSTRUCTION INFORMATION
U.S.A.R.C., Milwaukee

| Well No. | Well Type | Well Status | Install. Date | Ground Elev (ft) | Top/PVC Elev (ft) | Well ¹ Depth (ft) | Screened ¹ Interval (ft) | Lithology At Screen |
|-------------|--------------|-------------|---------------|------------------|-------------------|------------------------------|-------------------------------------|---------------------|
| 1) OW-101B | Observ. Well | Active | 11/84 | - | 686.89 | 20 | 10-20 | CL-ML, GW |
| 2) P-101A | Piezometer | Active | 10/84 | - | 686.86 | 46 | 41-46 | SM |
| 3) OW-102B | Observ. Well | Active | 11/84 | - | 686.04 | 20 | 10-20 | GW |
| 4) P-102A | Piezometer | Active | 10/84 | - | 685.99 | 45 | 40-45 | CL-ML, SM |
| 5) OW-103B | Observ. Well | Abandoned | 10/84 | - | 681.18 | 20 | 10-20 | GW, ML-CL |
| 6) P-103A | Piezometer | Abandoned | 11/84 | - | 681.98 | 45 | 40-45 | ML-CL, SM |
| 7) OW-104B | Observ. Well | Active | 10/84 | - | 691.98 | 20 | 10-20 | SM, CL-ML |
| 8) P-104A | Piezometer | Active | 11/84 | - | 692.11 | 38.3 | 33.3-38.3 | ML-CL |
| 9) OW-105B | Observ. Well | Active | 11/84 | - | 677.28 | 20 | 10-20 | CL-ML |
| 10) P-105A | Piezometer | Active | 11/84 | - | 677.43 | 45 | 40-45 | ML-CL, GW |
| 11) OW-106B | Observ. Well | Active | 11/84 | - | 677.07 | 20 | 10-20 | CL-ML, SM |
| 12) P-106A | Piezometer | Active | 10/84 | - | 677.02 | 45 | 40-45 | ML-CL |
| 13) OW-107B | Observ. Well | Inactive | 11/84 | - | - | - | - | - |
| 14) P-107A | Piezometer | Inactive | 11/84 | - | - | 15 | - | - |
| 15) OW-108B | Observ. Well | Active | 11/84 | - | 696.58 | 20 | 10-20 | ML, SM |
| 16) P-108A | Piezometer | Active | 11/84 | - | 696.48 | 42 | 37-42 | Limestone |
| 17) OW-109B | Observ. Well | Active | 10/84 | - | 694.99 | 20 | 10-20 | ML, ML-CL |
| 18) P-109A | Piezometer | Active | 11/84 | - | 694.88 | 36 | 31-36 | Limestone |
| 19) OW-111B | Observ. Well | Active | 10/84 | - | 690.93 | 20 | 10-20 | SM-ML, SM |
| 20) P-111A | Piezometer | Active | 10/84 | - | 690.97 | 38.5 | 33.5-38.5 | ML-CL |
| 21) OW-112B | Observ. Well | Active | 11/88 | 691.54 | 691.36 | 25.1 | 15.1-25.1 | CL, SM |
| 22) P-112A | Piezometer | Active | 11/88 | 691.76 | 691.22 | 44.4 | 39.4-44.4 | GM, CL |
| 23) OW-113B | Observ. Well | Active | 11/88 | 679.94 | 682.94 | 18.0 | 7.8-18.0 | CL, SM |
| 24) P-113A | Piezometer | Active | 11/88 | 679.98 | 682.98 | 44.0 | 39.0-44.0 | CL, SP |

¹Depth measured from ground surface during well installation.

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Wisconsin State Plane Coordinates for all wells installed at the U.S. Army Reserve Complex are presented in Table 1a. This table includes top of riser pipe elevations.

4.2.1 Well Nest OW-112B/P-112A

Observation Well (OW-112B)

On November 16, 1988, a boring was drilled for observation well OW-112B. Split-spoon samples were obtained from the boring at depths of 10, 15, and 20 feet during drilling operations. Total boring depth was 25 feet. Installation of this well was initiated by placing a 10-foot stainless steel screen and riser in the borehole. This activity was followed by the placement of filter pack sand in the well annulus. However, during measurement of the filter pack, a foot-long metal rod attached to the end of the measuring tape became stuck. Subsequent activities resulted in breaking off the tape in the well at a depth of approximately 16 to 17 feet below the ground surface necessitating abandonment. Following removal of the well screen and casing, the boring was backfilled with a cement/bentonite grout as specified in the Wisconsin Administrative Code.

On November 17, 1988, another boring was drilled for OW-112B at a location approximately 4.5 feet northwest of the abandoned borehole. This boring was drilled to a depth of 25.3 feet. The geologic strata encountered consisted of a sequence of clay, silt, sand, and gravel layers, and mixtures of the same.

A 2-inch (I.D.) stainless steel screen, with 0.010-inch openings was placed from a depth of 15 to 25 feet. A 2-inch (I.D.) stainless steel casing was placed from 6 inches below the ground surface to a depth of 15 feet in the well annulus.

Red flint filter pack sand (No. 30) was placed in the annular space between the well screen, casing, and native formation from a depth of 9.5 feet to 25.3 feet. The native formation in the screened interval was comprised of clay, silty, gravelly sand, and sandy to gravelly clay.

A 3-foot thick bentonite seal was placed above the filter pack and 0.5 feet of sand was placed above the bentonite seal. A 4-inch diameter, 5-foot long protective steel casing was placed over the observation well riser. The top of the protective casing was placed approximately 2 inches below the ground surface. A 5.8-foot thick concrete collar was placed in the annulus above the filter pack, to a depth of approximately 9 inches below the surface. Approximately 3 inches of sand was placed above the concrete collar. A flush-mount cover was placed over the protective casing and set into the concrete collar. Well construction was completed by sloping the concrete gently away from the flush mount cover to direct surface water drainage away from the well.

TABLE 1a
MONITORING WELL LOCATIONS AND ELEVATIONS
WISCONSIN STATE PLANE COORDINATE SYSTEM
SOUTH ZONE

| <u>Well No.</u> | <u>Y Value</u> | <u>X Value</u> | <u>Elevation*</u> <u>(NVD 1929)</u> |
|-----------------|----------------|----------------|--|
| OW101 | 417,120.9 | 2,539,200.1 | 686.89 |
| P101 | 417,122.9 | 2,539,195.3 | 686.86 |
| OW102 | 417,114.4 | 2,539,732.2 | 686.04 |
| P102 | 417,113.1 | 2,539,738.2 | 685.99 |
| OW103 | 415,878.8 | 2,538,943.5 | 681.18 |
| P103 | 415,879.8 | 2,538,946.4 | 681.98 |
| OW104 | 416,344.7 | 2,540,766.0 | 691.98 |
| P104 | 416,341.5 | 2,540,761.6 | 692.11 |
| OW105 | 415,395.9 | 2,539,101.0 | 677.28 |
| P105 | 415,392.3 | 2,539,100.6 | 677.43 |
| OW106 | 415,405.4 | 2,539,464.0 | 677.07 |
| P106 | 415,408.5 | 2,539,462.7 | 677.02 |
| OW108 | 415,740.9 | 2,540,544.3 | 696.58 |
| P108 | 415,733.8 | 2,540,540.4 | 696.48 |
| OW109 | 415,810.7 | 2,540,797.2 | 694.99 |
| P109 | 415,814.4 | 2,540,793.9 | 694.88 |
| OW111 | 415,375.6 | 2,541,016.9 | 690.93 |
| P111 | 415,372.3 | 2,541,016.7 | 690.97 |
| P112A | 418,021.4 | 2,539,211.5 | 691.76 |
| OW112B | 418,017.3 | 2,539,210.0 | 691.54 |
| P113A | 415,872.9 | 2,539,072.3 | 679.98 |
| OW113B | 415,877.9 | 2,539,068.3 | 679.94 |

*Elevation of top of PVC riser, referencing the 1929 National Vertical Datum.

Piezometer (P-112A)

Soil boring and soil sampling activities for boring B-112A were completed on November 22, 1988. Construction of piezometer P-112A was completed on November 23.

This boring was drilled to a depth of 45.5 feet before encountering refusal (bedrock?). An attempt was made to obtain a sample at the total boring depth with a split-spoon sampler. No sample was retrieved, however. The geologic strata encountered in this boring consisted of interbedded layers of clay, silt, sand, gravel, and mixtures of the same.

Two-inch (I.D.) stainless steel screen with 0.010-inch openings was placed from a depth of 39.4 feet to 44.4 feet.

Red flint filter pack sand (No. 30) was placed in the annular space between the well screen, casing, and native formation from a depth of 33.8 feet to 44.4 feet. The native formation in the screened interval was comprised of sandy gravel, gravelly sand, and silty clay.

An attempt was made to place a bentonite pellet seal above the filter pack. However, when the augers were pulled up slightly above the filter pack to allow space for placing bentonite pellets, formation material upwelled in the auger. Approximately 50 gallons of water obtained from U.S.A.R.C. Building 312 was used to remove the material. Over time, unconsolidated soil materials again slowly upwelled inside the auger. After reflushing the auger with an additional 50 gallons of water, a bentonite-sand slurry was tremied inside the auger from a depth of 33.8 feet, to a depth of 8 feet.

A 3-foot thick bentonite seal was placed above the bentonite-sand grout backfill. A 4-inch diameter steel protective casing was placed over the observation well casing. The top of the protective casing was set approximately 2 inches below the ground surface. A flush-mount cover was placed over the protective casing, and a 6-foot thick concrete collar was placed in the annular space between the protective casing flush mount cover and native formation. The concrete collar was sloped gently away from the cover to facilitate surface water drainage.

4.2.2 Well Nest OW-113B/P-113A

Observation Well (OW-113B)

Soil boring and sampling activities were completed at boring B-113B on November 14, 1988. Observation well OW-113B was constructed in this boring on November 15.

This boring was drilled to a depth of 20 feet. The geologic strata encountered consisted of interbedded layers of clay, silty sand and gravel, and mixtures of the same.

Split-spoon soil samples were taken at depths of 10 feet and 15 feet. At a depth of 15 feet, sandy clay material upwelled inside the auger when the plug was removed to allow for split-spoon soil sampling. The auger was flushed with clean water to remove the upwelled material. Approximately 100 gallons of water obtained from U.S.A.R.C. Building 312 were used to remove the material.

Two-inch (I.D.) stainless steel screen, with 0.010-inch openings was placed over the 8-foot to 18-foot depth interval. Two-inch (I.D.) stainless steel casing was placed from 3.1 feet above the ground surface to a depth of 8 feet.

Red flint filter pack sand (No. 30) was placed in annular space between the well screen, casing, and native formation over the 7- to 18.5-foot depth. The geologic strata present in the screened interval consisted of clayey silt, silty clay, silty gravelly sand, and silty sand.

A 2-foot thick bentonite seal was placed above the filter pack. A 4-inch diameter, steel protective casing was placed over the observation well casing. A 5-foot thick concrete collar was placed above the bentonite seal and extended upward to the ground surface. The concrete was sloped away from the protective casing to facilitate surface water drainage away from the well.

Piezometer (P-113A)

Boring B-113A was drilled and sampled on November 15 and 16, 1988. Construction of piezometer P-113A was completed on November 16.

This boring was drilled to a depth of 44.5 feet, at which depth bedrock was apparently encountered. No samples of bedrock were obtained, however. The geologic strata penetrated by this boring consisted of interbedded layers of clay, silt, sand, and mixtures of the same.

Two-inch (I.D.) stainless steel screen with 0.010-inch openings was placed from a depth of 38.8 feet to 44 feet. Two-inch (I.D.) stainless steel casing was placed from 3 feet above the ground surface to a depth of 38.8 feet.

Red flint filter pack sand (No. 30) was placed in the annular space between the well screen, casing, and native formation from a depth of 33.5 feet to 44.5 feet. The native formation in the screened interval consists of clay and well-sorted sand.

A 7-foot thick bentonite seal was placed above the filter pack. Approximately 19.5 feet of bentonite-sand-grout backfill was placed above the bentonite seal. A 2-foot thick, bentonite pellet seal was placed above the bentonite-sand slurry. A 4-inch diameter, steel protective casing was placed over the piezometer casing pipe and a 5-foot thick concrete collar was placed to the surface. The concrete was sloped away from the protective casing to facilitate surface water drainage away from the well.

4.2.3 Borehole Monitoring

Atmospheric monitoring was conducted during the soil boring and soil sampling operations with an HNu photoionization detector. This instrument is useful in the detection of selected volatile organics.

Borehole monitoring was accomplished by inserting the tip of the HNu into the borehole annulus. Formation samples were placed in zip-lock bags and the HNu probe was inserted through a small opening in the zip-lock to monitor air quality. No detects were observed in either the formation samples or the borehole.

The borehole was also periodically monitored for oxygen concentration and lower explosive limit with a combustible gas/oxygen indicator. No air quality anomaly was observed with this instrument.

An oily film was briefly observed on water seeping from drill cuttings collected during the drilling of boring B-113A. However, no volatile organics were detected with the HNu.

4.2.4 Well Development

Twin City Testing Corporation initiated well development after a minimum of 48 hours had elapsed following well construction. Well development is performed to remove fine-grained material from the well annulus, enabling a representative sampling of the groundwater. Each well was developed by pumping and/or surging the well with a hand pump, without the use of acids, dispersing agents or explosives.

Before, during, and after completion of purging, the chemical and physical characteristics of the water removed from each well were measured and documented. Measurements obtained included turbidity, color, odor, conductivity, pH and temperature. Wells OW-112B and P-112A were developed until a volume equaling five times the standing water volume in each well had been removed, or until the water was clear and the physical parameters were constant (± 10 percent). Approximately four well volumes were removed from Well OW-113B. Piezometer P-113A was purged dry, and then one well casing volume of distilled water was added to the well.

After the water was added, the well was surged and purged dry again. All well development information was recorded on a well purging and sample collection log (Appendix E).

Water levels were measured and recorded prior to purging each well. Well OW-112B was developed until 160 gallons were removed and the pH and conductivity had stabilized at 7.20 \pm 0.1 and 1000+ umhos/cm, respectively. Similarly, piezometer P-112A was developed until the water was clear, and the conductance had stabilized at 800 umhos/cm. A stabilized pH value of 6.80 \pm 0.1 was recorded for piezometer P-113A after 75 gallons had been removed. Some fluctuations were noted in the pH and conductance for Well OW-113B even after 100 gallons had been removed from the well.

4.3 Site Stratigraphy

The stratigraphic information obtained from borings B-112A/B-112B differs markedly from that observed in borings B-113A/B-113B. Soils encountered in borings B-112A/B-112B were much coarser in the basal portion compared to those penetrated in borings B-113A/B-113B, which were predominantly fine-grained.

The surface soils in the vicinity of well nests OW-112B/P-112A and OW-113B/P-113A appear to be silt-clay loams developed within a silty-clay drift. The soils appear to be poorly aerated and drained as evidenced by the abundant clay content and faint mottling. The permeability of the surface soil appears to be low (estimated at .1 to .5 inches per hour).

Well Nest OW-112B/P-112A

The soils at borings B-112A/B-112B generally consist of gray to brown-gray, gravelly sand and sandy gravel below a depth of 21 feet (to bedrock). Gravelly sands encountered contain a high percentage of angular limestone (dolomite) rock fragments, and a trace of subround gravel of igneous origin.

Gray-brown, silty clay with micrite clasts occurs over the 20-21 foot depth increment. Tan-gray, gravelly sand is present over the 15 to 20-foot depth. This sand unit is overlain by gray, gray-brown, buff and brown clayey silt and silty clay. The clayey silt at a depth of approximately 5 feet was faintly laminated. The laminates consisted of alternating silt and clay. Faint green mottling was apparent at a depth of 6 feet.

Well Nest OW-113B/P-113A

Bedrock was presumably encountered at a depth of 44.5 feet in borings B-113A/B-113B as the split-spoon sampler could not be advanced any further (no bedrock sample obtained). The strata encountered at this location consist primarily of silty-clay and clay, with occasional intercalated sand layers.

The color of the formation is predominantly gray in the basal 35 feet of the section, changing to light-gray to brown in the upper 10 feet. A trace of angular to round gravel (limestone/dolomite) was observed. Faint laminations were noted in a silty clay occurring at a depth of 26 to 27 feet.

4.4 Bedrock Configuration

Past and present boring programs conducted at the U.S.A.R.C. site has provided useful information regarding the configuration of the bedrock in the study area. In general, the attitude of the bedrock surface appears to mimic surface topography.

Based on available data, bedrock relief across the study area is approximately 30 feet. Lowest bedrock elevations occur in the vicinity of borings B-105A/B-105B and B-106A/B-106B. The maximum bedrock elevation (660 feet above mean sea level) occurs as a localized knob (bedrock "high") near borings B-108A/B-108B and B-109A/B-109B. It is also possible that the bedrock "high" is part of a northeast-southwest trending ridge. General slope of the bedrock surface across the study area is toward the south-southwest.

RP/USARMYM/AB1

5.0 HYDROGEOLOGY

Several lakes are present in the vicinity of the U.S.A.R.C. complex. Many are groundwater-dominated seepage lakes, hydraulically connected to the local groundwater system. Figure 4 shows water table contours derived from surface elevations recorded at nine lakes located in the vicinity of the U.S.A.R.C. The base map is a U.S.G.S. quadrangle, photo-revised in 1976. Water elevations recorded for each lake, suggest that regional groundwater flow is directed towards the southeast, with an average horizontal hydraulic gradient of approximately .006 ft/ft. The hydraulic gradient observed between higher and lower elevation lakes is not necessarily constant and may be influenced by local recharge mounds.

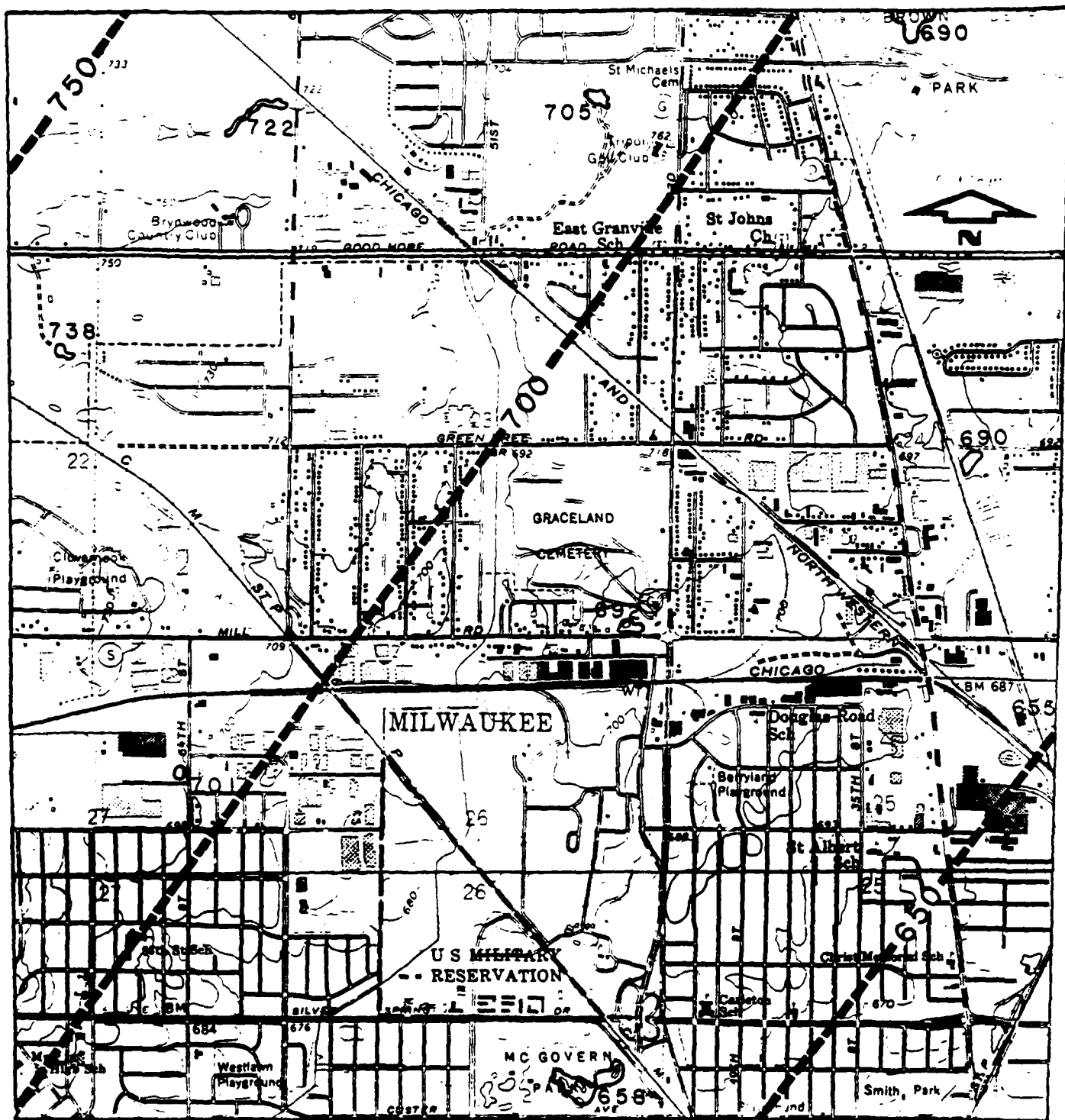
5.1 Site Hydrogeology

The hydrogeologic characteristics of the glacial drift unit have been studied more extensively than the hydrogeology of the underlying Niagara Dolomite at the U.S.A.R.C. site. Twenty wells installed at this site are screened in drift unit. The remaining two wells (P-108A, P-109) are screened 10 and 9 feet into the underlying limestone (dolomite).

Groundwater elevation data was obtained from all observation wells and piezometers during the course of this project (March, 1989). This information and historic water level data is summarized in Table 2.

Water level measurements taken on March 1, 1989 have been used to show the present configuration of the water table at the U.S. Army Reserve site (Figure 5). The water table map which has been prepared illustrates the general magnitude of observed horizontal gradients and direction of groundwater flow. The horizontal hydraulic gradient in the vicinity of wells P-101A/OW-101B and P-102A/OW-102B, southward to wells P-105A/OW-105B is approximately .002 ft/ft. The horizontal hydraulic gradient between well nests P-108A/OW-108B and P-106A/OW-106B is approximately .02 ft/ft.

Groundwater flow is directed towards areas of decreasing hydraulic head, as indicated by the arrows on Figure 5. The contoured water table elevation data suggests that groundwater is directed radially away from the bedrock "high" located near well nest OW-108B/P-108A. The predominant direction of groundwater flow away from this location, across other areas of the site, varies from southwesterly in the northern part of the study area, to southeasterly in the vicinity of well nests P-105A/OW-105B and P-106A/OW-106B.



SCALE

1" Equals 2000'

LEGEND

690  Lake Surface Elevation

---700--- Water Table Contour
Elev. (Ft.)
Datum (M.S.L.)

FIGURE 4

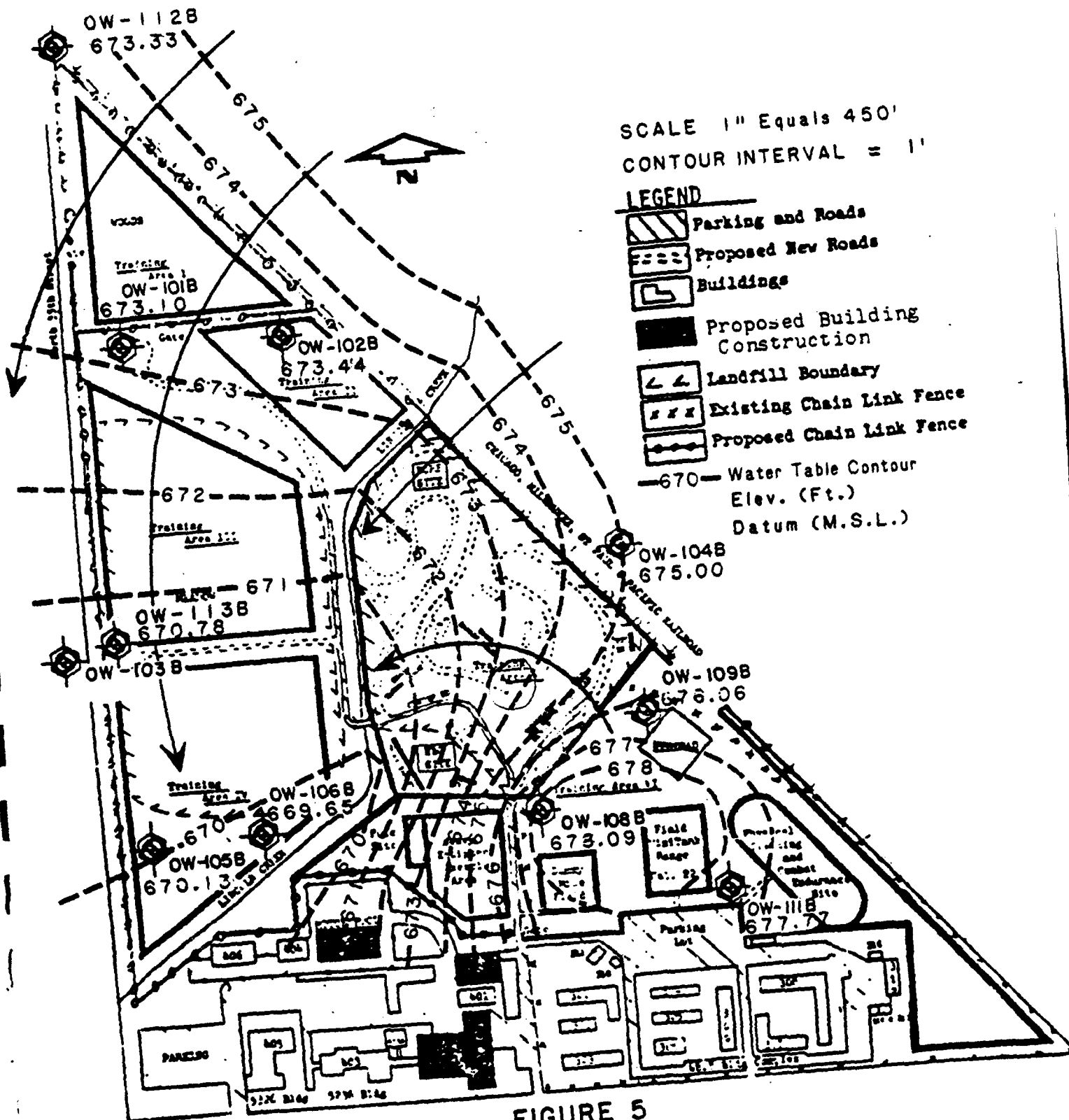
**WATER TABLE MAP
BASED ON LAKE ELEVATIONS
MILWAUKEE U.S.A.R. CENTER
COMPLEX AND TRAINING AREA
MILWAUKEE, WISCONSIN
DONOHUE & ASSOCIATES
1989**

TABLE 2
GROUNDWATER ELEVATION DATA

US Army Reserve 84th Division

Monitoring Well Elevation

| Well No. | T.O.P.(MSL) | 1/87 | 3/87 | 5/87 | 7/87 | 9/87 | 12/88 | 1/89 | 2/89 | 3/1 |
|----------|-------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| P-101A | 686.76 | 676.05 | 676.28 | 677.16 | 675.69 | 676.67 | 673.39 | 674.35 | 674.36 | 674.34 |
| OW-101B | 686.89 | 675.58 | 675.89 | 676.64 | 675.35 | 676.21 | 673.14 | 673.14 | 673.15 | 673.10 |
| P-102A | 685.99 | 675.95 | 676.20 | 676.95 | 675.59 | 676.56 | 673.14 | 673.37 | 673.37 | 673.21 |
| OW-102B | 686.04 | 676.04 | 676.35 | 677.09 | 675.71 | 676.64 | 673.47 | 673.47 | 673.48 | 673.44 |
| P-104A | 692.11 | | | | | | | | | Frozen |
| OW-104B | 691.98 | 680.67 | 677.32 | 678.22 | 676.13 | 677.24 | | | | 675.00 |
| P-105A | 677.43 | 671.74 | 672.25 | 672.76 | 671.75 | 672.44 | 669.33 | 669.38 | 669.36 | 669.34 |
| OW-105B | 677.28 | 670.84 | 670.84 | 671.58 | 670.80 | 671.39 | 669.99 | 670.12 | 670.15 | 670.13 |
| P-106A | 677.02 | 670.06 | 670.65 | 670.73 | 669.97 | 670.78 | 669.56 | 669.01 | 669.02 | 668.98 |
| OW-106B | 677.07 | 669.88 | 670.95 | 670.74 | 669.33 | 670.54 | 669.38 | 669.67 | 669.68 | 669.65 |
| P-108A | 696.48 | 680.31 | 681.65 | 682.45 | 679.88 | 682.18 | | | | 676.11 |
| OW-108B | 696.58 | 686.25 | 687.61 | 688.09 | 685.52 | 687.63 | | | | 678.09 |
| P-109A | 694.88 | 679.59 | 681.08 | 681.30 | 679.13 | 681.36 | | | | 675.12 |
| OW-109B | 694.99 | 679.99 | 681.62 | 682.48 | 679.57 | 681.92 | | | | 676.06 |
| P-111A | 690.97 | 677.80 | 679.31 | 680.58 | 677.76 | 679.87 | | | | 673.20 |
| OW-111B | 690.93 | 681.26 | 683.31 | 684.15 | 681.26 | 683.66 | | | | 677.77 |
| P-112A | 691.22 | | | | | | 673.28 | 673.32 | 673.33 | 673.30 |
| OW-112B | 691.36 | | | | | | 673.35 | 673.33 | 673.34 | 673.33 |
| P-113A | 682.98 | | | | | | 670.76 | 670.74 | 670.75 | 670.73 |
| OW-113B | 682.94 | | | | | | 670.73 | 670.76 | 670.80 | 670.78 |



Vertical gradients vary from strongly downward in well nests P-108A/OW-108B, P-109A/OW-109B, P-104A/OW-104B, and P-111A/OW-111B, to strongly upward at well nest P-101A/OW-101B. Strong downward gradients are indicated for wells located in the vicinity of the bedrock "high". Groundwater appears to move downward and radially away from this area.

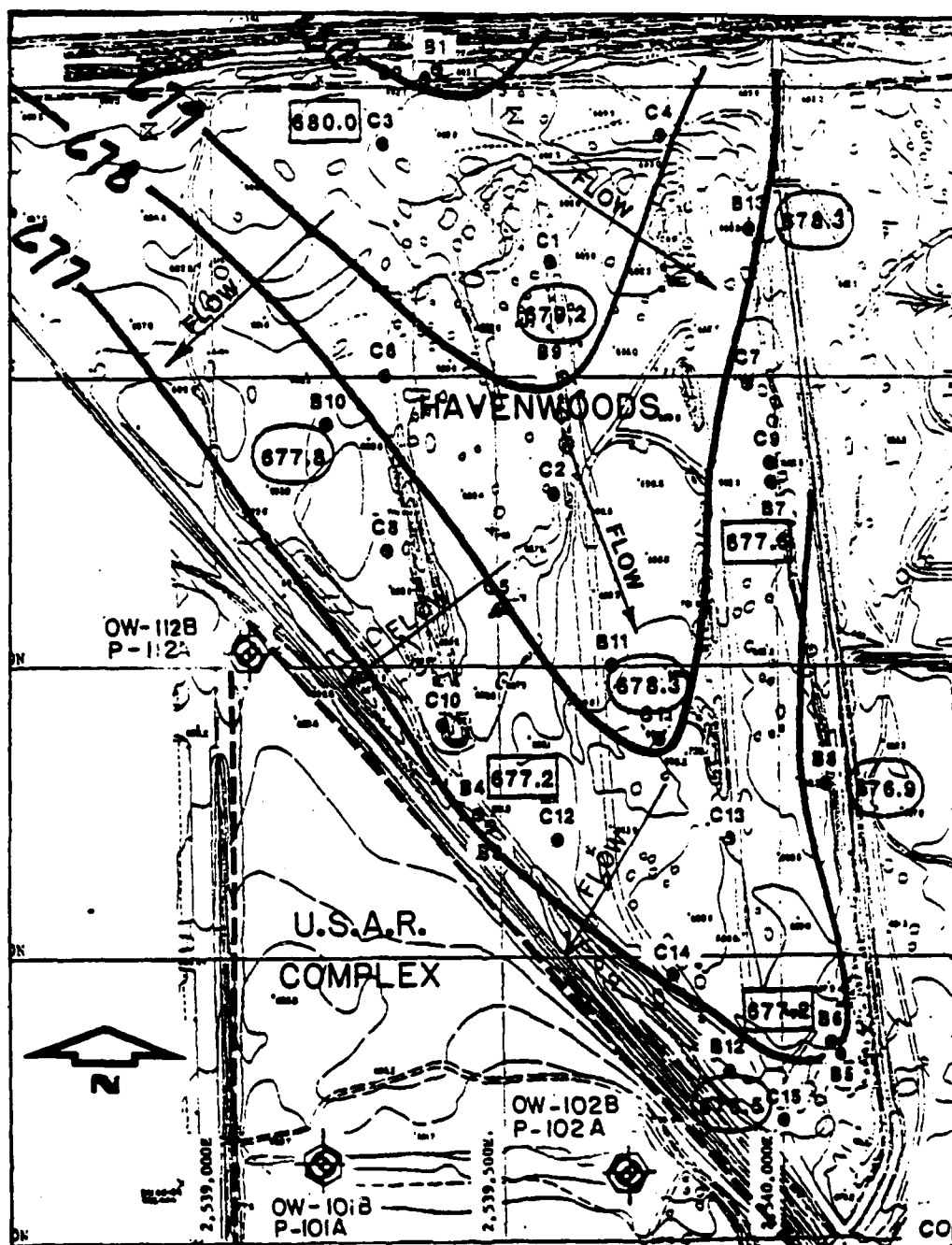
The observed groundwater mound located near well nest OW-108B/P-108A is recharged by local precipitation. Recharge to the aquifer in other areas of the site is obtained from local precipitation and infiltration flow.

In 1986-1987 Miller Engineers conducted a groundwater investigation at the Havenwoods Nature Preserve located northeast of the U.S.A.R. Center complex and training area. Staff with Miller Engineers concluded that "horizontal flow directions are to the southeast south-southwest toward both Lincoln Creek and the U.S. Army Reserve Complex". Figure 6 shows the configuration of water table at the Havenwoods study area developed from water level measurements taken in 1986 and 1987.

The water table map presented by Miller Engineers for the Havenwoods study area generally coincides with the water table map developed from this study. Groundwater is migrating from the vicinity of the Havenwoods study area toward the U.S.A.R. Center complex and training center.

The relationship between Lincoln Creek and the aquifer system is not known with certainty. It appears that water levels measured in observation wells OW-102B and OW-106B are at approximately the same elevation as water levels in Lincoln Creek. It is believed that Lincoln Creek is hydraulically connected to the drift aquifer and that flow in the creek is primarily sustained by groundwater discharge.

RP/USARMYM/AB2



SCALE

1" Equals 350'

LEGEND

— 678 — Water Table Contour
Elev. (Ft.)
Datum (M.S.L.)

FIGURE 6
WATER TABLE MAP
HAVENWOODS STUDY AREA
MILWAUKEE U.S.A.R. CENTER
COMPLEX AND TRAINING AREA
MILWAUKEE, WISCONSIN
DONOHUE & ASSOCIATES
1989

6.0 GROUNDWATER SAMPLING AND ANALYSIS

6.1 Groundwater Sampling

Groundwater samples were obtained from selected wells on December 21 and 22, 1988, and January 23 and 24, 1989, following proper well construction and development. Wells sampled for volatile organics included:

| | |
|----------------|----------------------------|
| P-101A/OW-101B | P-106A/OW-106B |
| P-102A/OW-102B | P-112A/OW-112B (new wells) |
| P-105A/OW-105B | P-113A/OW-113B (new wells) |

Table 3 provides a listing of the organic analytes determined by Donohue Analytical, and their associated analytical detection limits.

In addition, groundwater samples collected from each newly-installed well were analyzed for selected Public Health and Welfare Standards, and Indicator Parameters as shown in Table 4. These include:

1. Field parameters including temperature, pH, color, odor, turbidity and specific conductance.
2. Dissolved metals including iron, barium, chromium, mercury, lead, cadmium and arsenic.
3. Indicator parameters including COD, BOD, hardness, odor, alkalinity, nitrate + nitrite, ammonia-nitrogen, chloride, sulfate and boron.

Purging was conducted prior to sampling activities to ensure the collection of a representative groundwater sample. Samples were obtained by using a teflon bailer attached to a nylon rope. The first several bailer volumes retrieved from each well were discarded prior to sample collection. Sampling equipment was decontaminated between successive locations with liquinox and distilled water.

The physical characteristics of the groundwater obtained before, during and after the purging were recorded. Parameters noted included turbidity, color, odor, conductivity, pH and temperature. Each well was purged until stabilization of these parameters had occurred ($\pm 10\%$).

Analytical methods and groundwater sampling requirements are presented in Table 5. This table also indicates bottle and preservative requirements employed during groundwater sampling. Groundwater samples to undergo analysis for dissolved metals were field filtered using a 0.45 micron filter and a positive pressure filtering apparatus. Samples collected for volatile organics were not field filtered.

TABLE 3

ORGANIC ANALYTES
84th U.S. Army Reserve Complex and Training Center

| <u>CAS Number</u> | <u>Donohue Analytical Detection Limit (ug/l)</u> | <u>Volatiles</u> |
|-----------------------|--|---------------------------|
| 74-87-3 | <2 | Chloromethane |
| 74-83-9 | <2 | Bromomethane |
| 75-01-4 | <2 | Vinyl Chloride |
| 75-00-3 | <2 | Chloroethane |
| 75-09-2 | <1 | Methylene Chloride |
| 67-64-1 | <5 | Acetone |
| 75-15-0 | <10 | Carbon Disulfide |
| 75-35-4 | <1 | 1,1-Dichloroethene |
| 75-34-3 | <1 | 1,1-Dichloroethane |
| 156-60-5 | <1 | Trans-1,2-dichloroethene |
| 67-66-3 | <1 | Chloroform |
| 107-06-2 | <1 | 1,2-Dichloroethane |
| 78-93-3 | <10 | 2-Butanone |
| 71-55-6 | <1 | 1,1,1-Trichloroethane |
| 56-23-5 | <1 | Carbon Tetrachloride |
| 106-05-4 | | Vinyl Acetate |
| 75-27-4 | <1 | Bromodichloromethane |
| 78-87-5 | <1 | 1,2-Dichloropropane |
| 10061-02-6 | <1 | Trans-1,3-Dichloropropene |
| 79-01-6 | <1 | Trichloroethene |
| 124-48-1 | <1 | Dibromochloromethane |
| 79-00-5 | <1 | 1,1,2-Trichloroethane |
| 71-43-2 | <1 | Benzene |
| 10061-01-5 | <1 | Cis-1,3-Dichloropropene |
| 110-75-8 | <1 | 2-Chloroethylvinylether |
| 75-25-2 | <1 | Bromoform |
| 591-78-6 | <10 | 4-Methyl-2-Pentanone |
| 108-10-1 | <25 | 2-Hexanone |
| 127-18-4 | <1 | Tetrachloroethene |
| 79-34-5 | <1 | 1,1,2,2-Tetrachloroethane |
| 108-88-3 | <1 | Toluene |
| 108-90-7 | <1 | Chlorobenzene |
| 100-41-4 | <1 | Ethylbenzene |
| 100-42-5 | <1 | Styrene |
| | <2 | Total Xylenes |

RP/USARMYM/AA3

TABLE 4

FIELD PARAMETERS AND INORGANIC ANALYTES
84th U.S. Army Reserve Complex and Training Center

Indicator Parameters:

BOD
Alkalinity
COD
Hardness
Ammonia/Nitrogen

Field Parameters:

Temperature
Conductivity
pH
Turbidity
Color
Odor

Public Welfare Standards:

Chloride
Dissolved Iron
Sulfates

Public Health Standards:

Nitrate and Nitrite - Nitrogen

Other Dissolved Metals to Include:

Arsenic
Barium
Boron
Cadmium
Chromium
Lead
Mercury

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TABLE 5

ANALYTICAL METHODS AND GROUNDWATER SAMPLING REQUIREMENTS
84th U.S. Army Reserve Complex and Training Center

| Analyte | Well ** Detection Type | Limit | EPA Method Number/Reference | Sample Container | Preservative(s) | Holding Time |
|--------------------------|------------------------|-----------|-----------------------------|---------------------|--|---------------------|
| Color | P, E | - | Field Observation | Glass Jar | None | Analyze Immediately |
| Odor | P, E | - | Field Observation | Glass Jar | None | Analyze Immediately |
| Turbidity | P, E | - | Field Observation | Glass Jar | None | Analyze Immediately |
| pH | P, E | - | Field Observation | Glass Jar | None | Analyze Immediately |
| Conductivity | P, E | - | Field Observation | Glass Jar | None | Analyze Immediately |
| DISSOLVED METALS | | | | | | |
| Arsenic | P | 1 ug/l | 206.3/1 | 250 ml HDPE Bottle | 1:1 HNO ₃ to pH <2 | 6 Months |
| Barium | P | 200 ug/l | 208.1/1 | 250 ml HDPE Bottle | 1:1 HNO ₃ to pH <2 | 6 Months |
| Boron | P | 0.1 mg/l | 212.3/1 | 250 ml HDPE Bottle | None | 6 months |
| Cadmium | P | 1 ug/l | 213.2/1 | 250 ml HDPE Bottle | 1:1 HNO ₃ to pH <2 | 6 Months |
| Chromium | P | 2 ug/l | 219.2/1 | 250 ml HDPE Bottle | 1:1 HNO ₃ to pH <2 | 6 Months |
| Lead | P | 2 ug/l | 239.2/1 | 250 ml HDPE Bottle | 1:1 HNO ₃ to pH <2 | 6 Months |
| Mercury | P | 0.2 ug/l | 245.2/1 | 250 ml HDPE Bottle | 1:1 HNO ₃ to pH <2 | 28 days |
| Iron | P | 50 ug/l | 236.1/1 | 250 ml HDPE Bottle | 1:1 HNO ₃ to pH <2 | 6 Months |
| OTHER | | | | | | |
| Nitrate+Nitrite-Nitrogen | P | 0.05 mg/l | 353.2/1 | 250 ml Glass Bottle | 1:1 H ₂ SO ₄ to pH <2, 4°C | 28 Days |
| Ammonia-Nitrogen | P | 0.10 mg/l | 350.1/1 | 250 ml Glass Bottle | 1:1 H ₂ SO ₄ to pH <2, 4°C | 28 Days |
| Sulfate | P | 2 mg/l | 375.2/1 | 1000 ml HDPE Bottle | 4°C | 28 Days |
| Chloride | P | 0.5 mg/l | 325.2/1 | 1000 ml HDPE Bottle | None | 28 Days |

** P Denotes newly-installed well; E denotes pre-existing well

TABLE 5

ANALYTICAL METHODS AND GROUNDWATER SAMPLING REQUIREMENTS
84TH U.S. Army Reserve Complex and Training Center
(Continued)

| Analyte | Well** Type | Detection Limit | EPA Method Number/Reference | Sample Container | Preservative(s) | Holding Time |
|----------------------|----------------|--------------------|---|---------------------|--|--------------|
| Total Alkalinity | P | 5 mg/l | 310.2/1 | 1000 ml HDPE Bottle | 4°C | 14 Days |
| Hardness | P | 5 mg/l | 130.1/1 | 250 ml HDPE Bottle | 1:1 HNO ₃ to pH <2 | 6 Months |
| COD | P | 5 mg/l | 410.4/1 | 250 ml Glass Bottle | 1:1 H ₂ SO ₄ to pH <2, 4°C | 28 Days |
| BOD | P | 2 mg/l | 405.1/1 | 1 liter HDPE Bottle | None | 48 Hours |
| ORGANICS | | | | | | |
| Volatile Organics | P, E | 1-5 ug/l* | 624 Vials, Teflon Septa, No Headspace | (2) 40 ml glass | 4°C | 14 Days |

References:

1. EPA-600/4-79-020 revised 1983, "Methods for Chemical Analysis of Water and Wastes"
2. 40 CFR Part 136, Federal Register, October 26, 1984.

*varies by compound, refer to method.

** P Denotes proposed well; E denotes existing well

RP/USARMVM/AA4

Table 6 summarizes Donohue quality assurance/quality control requirements. Quality assurance standards for volatile organics were satisfied by collecting one duplicate, trip blank and field blank during each sampling event. Field blanks consisted of rinsates.

Specific sampling techniques and protocols utilized during this investigation are discussed further in the project workplan prepared by Donohue, entitled "Monitoring Well Installation and Groundwater Sampling and Analysis Plan" (November, 1988). This workplan also describes sample documentation, and sample handling procedures.

6.2 Groundwater Analysis and Results

Groundwater sampling results obtained during December, 1988, and January, 1989, are presented in Appendix F of this report. This appendix also includes historic groundwater quality data from 1987. A summary memorandum prepared by the Donohue Laboratory Quality Control Coordinator discussing data quality is also included in this appendix. Sampling events are summarized by well for indicator parameters, and volatile organic compounds.

6.2.1 Indicator Parameters

Concentrations of COD ranging from 15 to 30 milligrams per liter (mg/l) were observed in wells OW-101B/P-101A, OW-102B/P-102A, and P-105A. The remaining wells monitored at the site contained COD concentrations below the analytical detection limit of 5 mg/l. Analytical data obtained during this investigation, and historic water quality information indicates that BOD concentrations are near or below the analytical detection limit.

Boron concentrations in groundwater samples obtained from the site are less than 1 mg/l.

Generally, above normal conductivity values were observed at all well locations. Conductivity values observed in the groundwater samples obtained from this site ranged from 800 to 1400 micromhos. High specific conductives was also observed in well OW-112B.

Near neutral pH values were observed at all locations across the site except near well locations 112 and 113 where pH values ranged from 7.6 to 9.2 units. Total hardness concentrations at all wells were generally in the 500 to 900 mg/l range. Alkalinity values ranged from 300 to 500 mg/l.

TABLE 6

QUALITY ASSURANCE/QUALITY CONTROL REQUIREMENTS
84th U.S. Army Reserve Complex and Training Center

| <u>Well Type</u> | <u># Field Samples</u> | <u># Field Blanks</u> | <u># Trip Blanks</u> | <u>#Field Duplicates</u> |
|------------------|------------------------|-----------------------|----------------------|--------------------------|
| Existing | 8 | 1 | 0 | 0 * |
| New | 4 | 1 | 1 | 1 * |

* One field duplicate taken during each event. Second event field duplicate will be from well exhibiting detectable volatile organics in first event.

Sample Containers for Each
Field Sample, Blank, Duplicate

| <u>Analyte(S)</u> | <u>Container</u> |
|--|---|
| 1. Metals, Hardness | 1-liter HDPE bottle with 1:1 HNO ₃ to pH <2 |
| 2. Sulfate, chloride, BOD, alkalinity | 1-liter HDPE bottle cool to 4°C |
| 3. Ammonia, COD Nitrate + nitrite | 1-250 ml glass bottle, 1:1 H ₂ SO ₄ to pH <2 |
| 4. Volatile Organics | (2) 40 ml glass vials with Teflon septa, no headspace, 4°C |

RP/USARMYM/AA3

6.2.2 Public Welfare Parameters

Elevated chloride concentrations were observed at all monitoring well locations at the USARC site. The only noted exception occurred at well OW-106B, which contained approximately 20 mg/l chloride. Intermediate chloride concentrations, reaching a maximum of 100 mg/l, were observed at well locations 101, 102, 105, and 113. This concentration range is below the established Wisconsin DNR Preventative Action Limit (PAL). Highest chloride concentrations approached 200 mg/l for wells P-112A/OW-112B (upgradient). While the chloride concentration observed at well location 112 exceeds the PAL, the Enforcement Standard (ES) was not attained.

Observed sulfate concentrations generally fall in the range from 200 to 300 mg/l. The PAL established for sulfate was exceeded in all wells, and several wells exceeded the ES.

Dissolved iron concentrations are extremely variable across the USARC site. Analytical results range from the analytical detection limit of 0.05 mg/l to values exceeding 3 mg/l. In general, the concentration Enforcement Standard. Consistently high iron concentrations have been observed in wells P-101A, P-105A, P-112A, and OW-112B.

6.2.3 Public Health Parameters

The concentration of toxic metals in the groundwater at this site was generally below the analytical detection limit. Nitrate + nitrate-nitrogen concentrations were also near or below the analytical detection limit (all locations).

Volatile organic compounds (VOCs) have been detected at all well locations monitored during this program. Vinyl chloride presence was not confirmed in wells OW-101B, P-101A, OW-102B, P-102A, and P-105A. Elevated vinyl chloride concentrations were observed in these wells during the February 1987, and July 1987, sampling events. The compound cis-1, 2-dichloroethylene was confirmed in wells OW-101B, OW-102B, and P-102A. Concentrations observed are similar to those detected during 1987 sampling events.

Dichlorobenzene isomers were detected in wells P-102A, P-105A, OW-105B, OW-106B, P-106A, and P-113A. Only well P-102A showed comparable isomer concentrations during the most recent (December, 1988; and January, 1989) sampling events.

The highest concentrations of volatile organic compounds were detected in groundwater samples obtained from well nest OW-112B/P-112A (upgradient). Maximum concentrations detected were: cis-1, 2-dichloroethylene, 762 mg/l; trichloroethylene, 209 mg/l; 1-dichloroethane, 104 mg/l. Elevated concentrations were confirmed during both the December, 1988, and January, 1989 events. The majority of volatile organics detected at well nest OW-112B/P-112A are ES exceedances.

7.0 SUMMARY AND CONCLUSIONS

Previous studies by Donohue (1985) and Foth and Van Dyke (1988) have shown that groundwater at the U.S.A.R.C. complex has been impacted by chloride, arsenic, cadmium, iron, and volatile organic compounds. Analytical data obtained during this investigation has also documented groundwater impact at several monitoring well locations across the site. Enforcement standards have been exceeded for sulfate, dissolved iron, and volatile organic compounds. The most significant impacts in groundwater quality were observed near the northern portion of the U.S.A.R.C. site. Well nest OW-112B/P-112A have shown PAL and ES exceedances for selected indicator, public welfare, and public health parameters, including volatile organic compounds.

Groundwater elevation data obtained during this study has indicated that generally groundwater flow within the shallow unconfined water table system is directed towards the south and southwest. A subsurface study conducted at the Havenwoods Nature Preserve located just northeast of the U.S.A.R.C. complex also indicated that groundwater flow is directed southeast-south-southwest from the Havenwoods Nature Preserve, towards Lincoln Creek and the U.S.A.R.C. site. This information indicates that the most impacted well nest (P-112A/OW112B) is located upgradient from the U.S.A.R.C. site, and downgradient from the Havenwoods Nature Preserve. Based on the information obtained during this investigation and summarized in this report it appears that the groundwater impacts presently observed at the U.S.A.R.C. site have resulted from an off-site source located northeast of the U.S.A.R.C. site.

RP/USARMYM/AB4

BIBLIOGRAPHY

Donohue & Associates, 1985, Landfill Impact Evaluation, USAR Center Complex and Training Area, Milwaukee, Wisconsin; prepared for U.S. Army Corps of Engineers (Omaha).

Donohue & Associates, 1988, Monitoring Well Installation and Groundwater Sampling and Analysis Plan for the U.S. Army Training Reserve - 84th Division, Milwaukee, Wisconsin (project work plan).

Foth & VanDyke, 1988, Landfill Sampling and Analysis, USARC, West Silver Spring Drive, Milwaukee, Wisconsin; prepared for U.S. Army Corps of Engineers (Fort McCoy).

Giles Engineering, 1985, Boring Logs, Soil Classification, and Well Diagrams, U.S. Army Reserve Training Center, Milwaukee, Wisconsin.

Miller Engineers, 1988, Hydrogeologic Investigation and Groundwater Quality Assessment Report, Haven Woods State Forest, Milwaukee, Wisconsin; prepared for Wisconsin Department of Administration.

Twin City Testing, 1988, Report of Subsurface Exploration and Monitoring Well Installation Program, United States Army Reserve Center, Milwaukee, Wisconsin.

RP/USARMYM/AB5

ATTACHMENT 1

DEPARTMENT OF ARMY
REQUEST FOR PROPOSAL
SCOPE OF SERVICES



DEPARTMENT OF THE ARMY

HEADQUARTERS, FORT MCCOY
SPARTA, WISCONSIN 54686-8000

August 10, 1988

REPLY TO
ATTENTION OF

Acting Chief, Engineering Plans
and Services

Donohue & Associates, Inc.
1705 Wilson Avenue
Plover, Wisconsin 54467

Gentlemen:

You are requested to submit your proposal for Open-End Contract No. DACA45-87-D-0075 for Monitoring Well Construction and Groundwater Analysis Milwaukee, WI., project number HA01005-8P.

Description of work is outlined in the enclosed scope of work.

Required completion date is presently set at March 1, 1989.

Fee negotiation for this work order proposal is to be conducted with your firm's representative at Building 2111, Directorate of Engineering, Engineering Plans and Services Division, Fort McCoy, Wisconsin, on August 31, 1988, at 1:00 PM.

Fee shall include all costs for accomplishing the work stated in the scope of work to include any fees for state plan reviews and approvals.

Sincerely,

John O. Calvert
Acting Chief, Engineering Plans and
Services Division
Contracting Officer's Representative

Enclosures

SCOPE OF WORK

1. TITLE AND IDENTIFICATION OF PROJECTS:

- a. Projects shall be identified by the following Fort McCoy names and related numbers:

1) Project Name: Monitoring Well Construction and Groundwater Analysis; 84th Division, Milwaukee, WI

Project Number: HA01005-8P

Drawing Number: 47-018-2041

- b. Purpose:

- Install two well nests.
- Determine source direction for elevated levels of vinyl chloride.
- Monitor and evaluate other groundwater quality parameters.

2. PROJECT COORDINATION:

- a. The project shall be coordinated through Mr. John Esson at Fort McCoy, phone (608) 388-2408.

3. PROJECT REVIEW:

- a. The project shall be reviewed by Fort McCoy at 50% and 98% completion. The 50% completion represents completion of all well construction and first round water sampling and analysis.
- b. The reviews shall be conducted in Building 2171 at Fort McCoy. Attendees will include your firm's representative(s), contracting officer representative, project manager and other representatives within the Directorate of Engineering (DE) and 84th Division.
- c. Provide six (6) copies of well construction and lab analysis reports for the first round groundwater analysis.
- d. Provide eight (8) copies of the final evaluation report one week prior to the 98% meeting.
- e. A complete report of project findings and evaluation of the source, extent and degree of any contamination shall be submitted. The report shall include complete well construction documentation and diagrams.

The draft report shall be submitted to Fort McCoy 90 calendar days after the notice to proceed. The final report shall be submitted 150 days after the notice to proceed.

- f. A qualified hydrogeologist shall interpret all geologic and hydrogeologic data and sign the final report. The report must also include the following statement:

"I, (hydrogeologist's signature) certify that I am a hydrogeologist and meet or exceed the requirements of

NR.500.03(64), Wisc. Admin. Code."

- g. All documents shall be submitted in accordance with NR 500.05.
- h. Fort McCoy reserves the right to schedule additional intermediate reviews if necessary. Your firm shall provide copies of review comments as indicated above. All reviews shall be scheduled a minimum of one week in advance.

4. BACKGROUND INFORMATION:

Two (2) groundwater investigations have been completed to date. Elevated levels of vinyl chloride were detected in some north and west monitoring wells, but additional monitoring wells are required to determine if the contamination source is on US Army Reserve property. The following reports and data will be available for review and guidance:

- a. Donohue & Associates, Inc. 1985. Landfill Impact Evaluation, USAR Center Complex & Training Area, Milwaukee, Wisconsin. Included well construction documentation and groundwater analysis.
- b. Foth & Van Dyke & Associates, Inc. 1988. Landfill Sampling and Analysis, USARC, West Silver Spring Drive, Milwaukee, Wisconsin. Includes VOC and inorganics groundwater analysis and landfill cap analysis.

5. GENERAL TASKS:

Work shall include constructing two (2) well nests, collecting water samples and analyzing for inorganics and volatile organic compounds (VOC). Contractor shall coordinate with the Wisconsin Department of Natural Resources (WDNR) for required detection limits. Contractor shall also interpret test results and prepare a detailed technical report of the project findings.

6. SPECIFIC REQUIREMENTS:

a. Well Construction/Development

- 1) Install two (2) groundwater monitoring well nests, consisting of two wells each, as shown on the Milwaukee Site Plan (Encl 1). Wells will be constructed of 2-inch casings made of a material which will not react with or contaminate the groundwater. PVC is not acceptable. Boring samples shall be taken every 5 feet and as new geologic formations are encountered. Boring logs and well construction diagrams shall be prepared for each well. Well construction and development shall comply with WDNR requirements including NR 508.05, NR 508.06 and NR 1411 (proposed) or other DNR-approved methods.
- 2) Fort McCoy will provide the exact location of new monitoring wells at the time of construction.

b. Water sampling and laboratory analysis

- 1) Collect two (2) rounds of water samples from the following wells:

| | |
|-----------|-----------------------|
| 101A/101B | 106A/106B |
| 102A/102B | 112A/112B (new wells) |
| 105A/105B | 113A/113B (new wells) |

Sampling periods shall be as least 60 days apart.

- 2) Conduct gas chromatography (GC) scan for volatile organic chemical compounds on water samples taken above. All compounds detected in the GC scan shall also be quantified with a ~~GC/MS~~ scan.
- 3) Take water level measurements at each of the above wells on four (4) occasions.
 - During each sampling round.
 - 30 days following the 1st sampling round.
 - 30 days following the 2nd sampling round.
- 4) For new monitoring wells #112A/112B and 113A/113B, conduct laboratory analysis on each sample collected for:

Field H₂O temp.
Field pH
Field conductivity (corrected to 25° C)
COD
BOD₅
Dissolved Iron
Hardness
Total Alkalinity
Nitrogen as NO₂ - NO₃
Ammonia as NH₃
Barium
Chloride
Sulfate
Chromium
Mercury
Lead
Cadmium
Arsenic
Boron
Color/odor/turbidity

- 5) Samples shall be tested in a laboratory certified for VOC's by the WDNR, in accordance with NR149.
 - 6) All parameters shall be tested at or below detection levels acceptable to the WDNR.
 - 7) Sampling and testing shall be performed by WDNR and EPA-approved methods and in accordance with the attached Sampling Standards guideline (Encl 2).
- c. Contractor shall evaluate the source of any contaminants and determine the source direction for the elevated levels of vinyl chloride.

7. BID PROPOSAL:

Bid proposal shall include the proposed well construction details including drilling techniques, construction materials, casing material, well depth, screen length, well seal type and depth, vandalism protective measures and quality control measures, etc.

8. OBLIGATIONS:

This project is subject to approval by the Wisconsin DNR. The project must be in compliance with, and must include all information required in, NR 508.05 and NR 149 or the Wisconsin Administrative Code, for submission to the DNR.

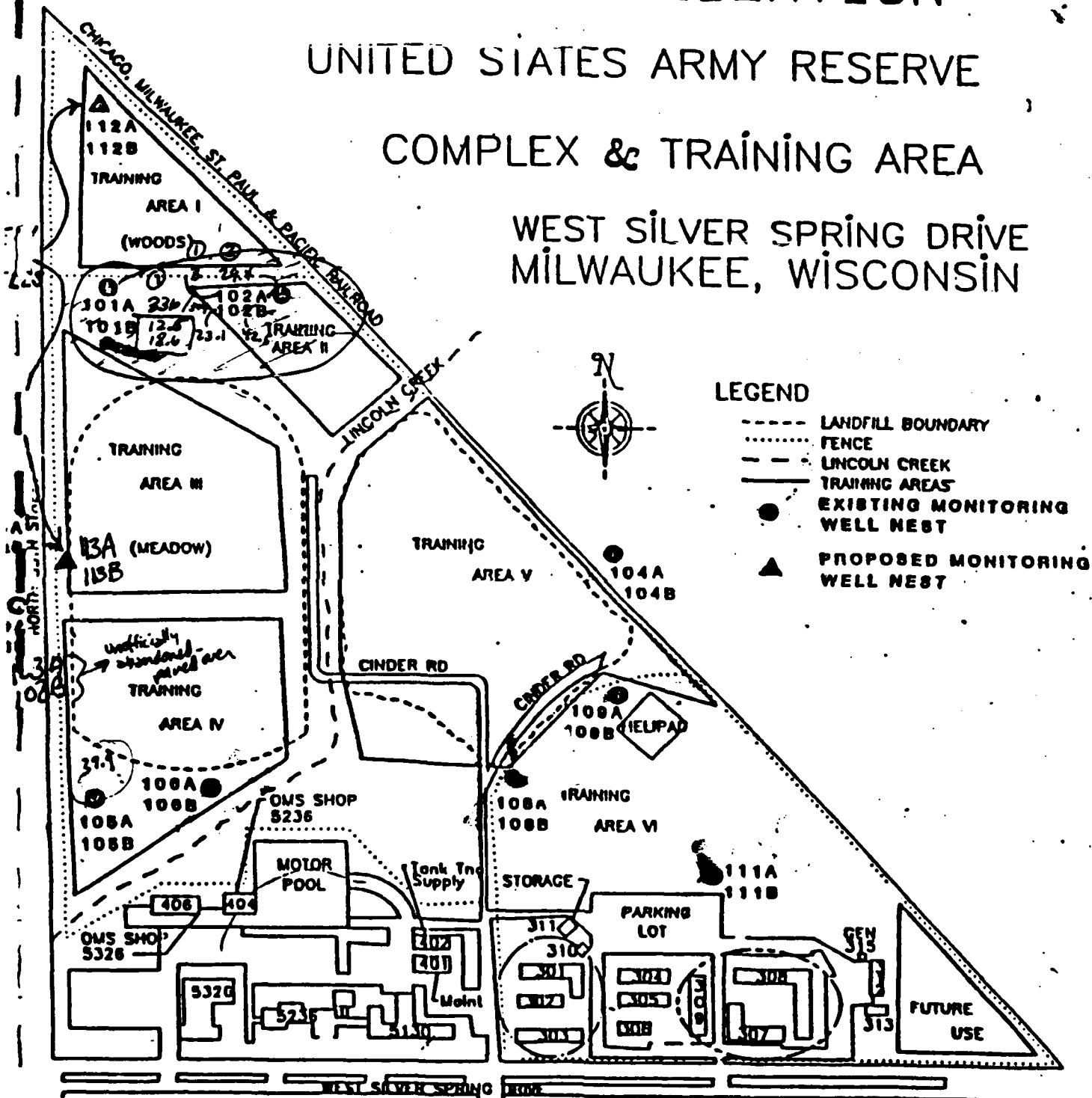
SUBJECT: Ground-Water Consultation No. 38-26-0876-88, th Division (Training),
Milwaukee, Wisconsin, 2-16 November 1987

CURRENT UTILIZATION

UNITED STATES ARMY RESERVE

COMPLEX & TRAINING AREA

WEST SILVER SPRING DRIVE
MILWAUKEE, WISCONSIN



MILWAUKEE SITE PLAN MONITORING WELL LOCATIONS

SAMPLING STANDARDS

Water sampling on this project shall be conducted in accordance with the following paragraphs:

- I. All procedures for sampling and analysis shall be recorded each sampling period. Any deviations from standard procedures shall be noted and reason given for the change.

- A. Sampling Procedures. The methods used or proposed to be used to obtain, preserve and analyze groundwater samples shall be described. The following elements shall be included:

1. Filtering of the samples, especially for metals, shall be conducted in the field. Standard preservation techniques shall be followed
2. Field blanks shall be obtained during the sampling program. One field blank at the start, at midpoint, and at the end.
3. Device(s) used to retrieve samples.
4. Procedures used to flush wells prior to collecting samples, with approximate water volumes removed and approximate time elapsed between flushing and sampling.
5. Procedures for cleaning samplers (such as bailers) between wells.
6. The order of well sampling from least to most contaminated, if known, or up-gradient to down gradient.
7. Equipment used to measure conductivity and pH in the field.
8. Volume of samples collected; procedures for filtering samples prior to analysis; procedures for chemical preservation of samples; and time at which filtration and preservation are carried out.
9. Methods for transporting samples to the lab, the time spent transporting the samples to the lab, and the time passed before the samples are analyzed in the lab.
10. Analytical procedures used in the lab for each required chemical parameter, including make and model of any automated analytical equipment used. If procedures are exactly as described in published sources, references may be listed to fulfill this equipment.

- B. Because of the volatile nature of organics, special equipment shall be used and field sampling techniques followed for obtaining water for organic analysis:

1. Teflon bailers shall be used. Stainless steel bailers are less desirable because some organics may be absorbed by metal.
2. Monofilament or nylon line shall be used for lowering the bailer. Cut off the end of line each time and retie.
3. Triple rinsing of the bailer and line, using deionized distilled laboratory grade water, shall be conducted in the field between each sample location.

4. Glass vials with Teflon-lined screw-on caps shall be over filled so air bubbles are excluded and a positive meniscus is achieved. Vials should be capped immediately after being filled.
5. Emptying the bailer and filling the sample vials shall be conducted with a minimum of turbulence to avoid degassing. The use of a bottom emptying device with the bailer is recommended.
6. All samples shall be immediately stored in freezer packs and kept on ice during shipment to the laboratory.
7. One bailer blank shall be collected and analyzed during each sampling period. After the triple rinse decontamination procedure and before sampling the next well, a sample consisting of deionized, distilled water shall be passed through the bailer and collected. A travel blank shall also be analyzed.

APPENDIX A
DONOHUE BORING LOGS

Donohue

BORING LOG

SOIL BORING NO.

Engineers & Architects
COMPUTER AIDED DESIGN/DRAFTINGSITE: U.S.A.R.C. PROJECT NO. 15977.007DN 112 BDRILLING METHOD: Auger - Hollow StemFOREMAN: Gerry WellnerASSISTANT: NeilGEOL./ENG'R: Joel GirardLOG BY: J. Girard

WATER LEVEL READINGS

| DATE | TIME | DEPTH | W.D. | S.C.R. | A.C.R. | MRS. A.D. |
|-------|------|-------|------|--------|--------|-----------|
| 11/16 | 8:00 | 16.1 | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

GROUND SURFACE ELEV. PHYSICAL SETTING: flat / gently slope.DATE START: 11-16-76DATE COMPLETE:

| DEPTH TO CHANGES IN STRATA | DEPTH IN FEET | SAMPLING DATA | | | | | | | | USCS | SOIL DESCRIPTION | COMMENTS |
|----------------------------|---------------|---------------|----|---|---|-------------|-------|------|---|------|---|---------------------|
| | | NO. | T | A | R | PENETRATION | | | | | | |
| | | | | | | 1st | 2nd | 3rd | N | | | |
| | | | | | | | | | | ML | dk brn soil silty clay, organic matter | |
| | | | | | | | | | | CL | clayey sand | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | CL | tan brn silty clay | |
| | | | | | | | | | | | dry fractured | dry |
| | | | | | | | | | | CL | tan brn silty clay | |
| | | | | | | | | | | ML | clayey silt | dry |
| | | | | | | | | | | CL | tan br silty clay | faint lamination |
| | | | | | | | | | | | chunks | |
| | | | | | | | | | | CL | tan br silty clay | dry powdery |
| | | | | | | | | | | | trace gravel | finer med limestone |
| | | | | | | | | | | CL | tan br silty clay | |
| | | | | | | | | | | | trace gravel and co sand. | |
| | | | | | | | | | | CL | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | CL | br lt tan silty clay | |
| | | | | | | | | | | | trace gravel | round to sub round |
| | | 1 | SS | | | 2 | 7/8 | 7/16 | | CL | gy brn silty clay | tr. co. fraction |
| | | | | | | | | | | | moist - balls up | cohesive |
| | | 1 | | | | | | | | ML | yellow br to gray - oxidized | |
| | | | | | | | | | | CL | silty clay with 5% sand | moist |
| | | | | | | | | | | CL | gy brn silty clay | broken rock ang. |
| | | | | | | | | | | | 2-3% granule - micrite L.S. | wet to damp |
| | | | | | | | | | | SC | clayey gravelly sand - gray | |
| | | | | | | | | | | | angular L.S. fragments, clay sand matrix | |
| | | | | | | | | | | CL | gy brn silty clay | |
| | | | | | | | | | | | trace granule | |
| | | 2 | SS | | | 1.5 | 1 1/4 | 5/8 | | CL | 0.5' mottled clay gy. brn laminations | Drilling |
| | | | | | | | | | | SM | silty gravelly sand - gray - broken L.S. rock | Crunchy |
| | | 2 | | | | | | | | SM | angular fragments - dry (no moisture) | grinding |
| | | | | | | | | | | | Sand Veg - Veg medium rig. | Sound |
| | | | | | | | | | | | | |
| | | | | | | | | | | | Dry silty clay - questionable samples | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | 3 | SS | | | 1/2 | 4/8 | | | CL | .5' gy brn clay with ang. rock fragments | |
| | | | | | | | | | | SM | Saturated .5' Sand med. fr. | Crunchy |
| | | 3 | | | | | | | | | abundant APITL FES. possible powder - broken | grinding |
| | | | | | | | | | | | | Sound |
| | | | | | | | | | | | | |
| | | | | | | | | | | | Wet clay - poor samples | |
| | | | | | | | | | | | questionable representation | |
| | | | | | | | | | | | round gravel in clay matrix | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |

ADDITIONAL DRILLING DATA

Split Tube Size ID OD
 Hammer Wt. 141.7 lb 30 in drop
 Thin Wall Tube Size OD
 Casing Used LF Dia.
 Casing Hammer lb in drop
 Drill Rod Size
 Drill Bit Type (a) (b)
 Drill Bit Size (a) (b)
 Auger Type 6 3/4 OD
 Hollow Stem Auger 1 1/2 ID
 Core Barrel Size ID Length
 Core Bit Serial
 Core Bit Serial
 Drill Mud Type
 Drill Mud Formula
 Depth Drill Mud Used
 Back Filled Date
 Method by
 Drill Rig Mfg. Mod.
 Other Equip.
 Other Equip.

DRILLING INFORMATION

- 1 Record measurements in tenths of feet.
- 2 For samples, record sample type (split spoon, Shelby, core) depths, sample interval, length of sample recovered.
- 3 Record first encountered water and any other distinct water producing zones.
- 4 Record blow counts (density), hammer weight, length of fall for driven samples.
- 5 Record use of drilling fluid, fluid type, source of water, fluid losses, interval (and soil type) where fluid loss occurred, if determinable, quantitative estimate of volume of fluid lost.
- 6 Record drilling equipment used and general drilling procedures.
- 7 Record all problems encountered during drilling.
- 8 Collect samples of backfill, grout, and concrete.
- 9 Report general drilling conditions (temperature, raining, etc.)

Soil/Rock Description Requirements

- 1 Soil
 - a. Written classification
 - b. USCS symbol
 - c. Estimated % of secondary components (% and size gravel, cobbles)
 - d. Color, mottling
 - e. Plasticity (general)
 - f. Consistency (cohesive) or density (non-cohesive)
 - g. Moisture
 - h. Texture/fabric/bedding
 - i. Depositional environment
- 2 Rock
 - a. Classification
 - b. Lithologic characteristics
 - c. Bedding/banding
 - d. Color
 - e. Hardness
 - f. Degree of cementation
 - g. Texture
 - h. Structure
 - i. Degree of weathering
 - j. Solution or void conditions
 - k. Primary and secondary estimated hydraulic conductivity, rationale
 - l. Note natural and coring induced rock breaks, and lost core including probable reason for. Include number of fractures per foot, number of fractures per total length of recovery.

| Texture | Abbreviation | Size | Abbreviation | Soil Particle Size |
|---------|--------------|--------|--------------|---------------------|
| Boulder | Bo | | | Over 3.0" |
| Gravel | Gr | Large | L | 1.0" to 3.0" |
| | | Medium | M | .38" to .99" |
| | | Small | Sm | 2.0mm to .38" |
| Sand | S | Coarse | Co | .75mm to 1.99mm |
| | | Medium | M | .25mm to .74mm |
| | | Fine | F | .05mm to .24mm |
| Silt | Si | | | .002mm to .049mm |
| Clay | C | | | Smaller than .022mm |

| Consistency | Abbreviation | N | Density | Abbreviation | N |
|-----------------|---------------------|---------|--------------|--------------|-------|
| Very Soft | VS | 0-2 | Very Loose | VL | 0-4 |
| Soft | S | 3-4 | Loose | L | 5-9 |
| Medium | M | 5-8 | Medium Dense | MD | 10-29 |
| Stiff | St | 9-16 | Dense | D | 30-49 |
| Very Stiff | VST | 17-30 | Very Dense | VD | 50+ |
| Hard | H | Over 30 | | | |
| % of Dry Weight | Term | | Abbreviation | | |
| 0-10 | Trace or Occasional | | TR or OC | | |
| 11-20 | Little | | LI | | |
| 21-35 | Some | | SO | | |
| 36-50 | And or With | | & or W/ | | |

CONDITIONS FOR USE OF SOIL BORING LOG

This field soil boring log records the soil descriptions and other data observed or measured in the field by qualified soil technicians. The soils between the samples may have been determined by the "feel" of the drill bit or wash cuttings. The changes between the soil strata may be transitional rather than abrupt, particularly with respect to color, weathering, and consistency changes. The amount of large sized gravel or boulders is generally estimated because the sampling tubes seldom retain these larger sized soil particles. Delayed readings of ground water levels may not be entered on this field log.

Donohue

BORING LOG

SOIL BORING NO.

Engineers & Architects
CONCRETE AND DESIGN/CONSTRUCTION

SITE: U.S.A.R.C. PROJECT NO. 15777.007

112-A
Piezometer

DRILLING METHOD: Hollow Stem Auger
FOREMAN: John
ASSISTANT: Bob
GEOL./ENG'R: J. Girard
LOG BY: J. Girard

WATER LEVEL READINGS
DATE TIME DEPTH W.D. S.C.R. A.C.R. MRS. A.D. MRS. A.D.
11-22 4:15 PM 10.4' S.C.R.
11-23 2:45 PM 18' A.C.R.
MRS. A.D. MRS. A.D.

GROUND SURFACE ELEV. _____
PHYSICAL SETTING: 1/2" - 1/4" S.W. 1/4
DATE START: 11-22-88
DATE COMPLETE: 11-23-88

| DEPTH TO CHANGES IN STRATA | DEPTH IN FEET | SAMPLING DATA | | | | | | | USCS | SOIL DESCRIPTION | COMMENTS | |
|----------------------------|---------------|---------------|----|---|---|-------------|-----|-----|------|------------------|--|-------------|
| | | NO. | T | A | R | PENETRATION | | | | | | |
| | | | | | | 1st | 2nd | 3rd | | | | N |
| | 1 | | | | | | | | | CL | dk brn silty clay top soil, organic & 5% co-med sand, moist, cohesive. | |
| | 2 | | | | | | | | | CL | brn silty clay, dark < 5% coarser chunky cuttings - med. moisture | |
| | 3 | | | | | | | | | | brn silty clay, same as above. | |
| | 4 | | | | | | | | | | tan brn to yellow brn clayey silt | |
| | 5 | | | | | | | | | | cohesive < 1% coarse, dry @ 4'-5' | |
| | 6 | 1 | S | | | 12 | 13 | | | ML | buff H tan clayey silt, faintly laminated, dry to slightly moist | |
| | 7 | | | | | | | | | | 20 coarser fraction - some mottling - green | |
| | 8 | | | | | | | | | | | very clayey |
| | 9 | | | | | | | | | | | |
| | 10 | | | | | | | | | CL | gy brn silty clay, dry to silty moist | |
| | 11 | 2 | SS | | | 5 | 12 | | | | 10% med-fn sand, round grains, gray to silty | |
| | 12 | | | | | | | | | | 4 brn silty clay, moist, broken l.s. fragments | coarse |
| | 13 | | | | | | | | | | angular, clay-cohesive clasts | some |
| | 14 | | | | | | | | | CL | 12.5' gy silty clay with 14 gy l.s. fragments | easy to cut |
| | 15 | | | | | | | | | | angular frags, fresh breaks < 5% subround grav | but crumbly |
| | 16 | | | | | | | | | | igneous origin | Rocky |
| | 17 | | | | | | | | | | | |
| | 18 | | | | | | | | | | | |
| | 19 | | | | | | | | | | | |
| | 20 | | | | | | | | | | | |
| | 21 | 4 | SS | | | 14 | 30 | | | CL | 4 gy brn, silty clay with mica fragments | Saturated |
| | 22 | | | | | | | | | CL | med fine-grained fresh breaks < 5% | crumbly |
| | 23 | | | | | | | | | | coarse fraction | to 24' |
| | 24 | | | | | | | | | | clay - mostly wet | |
| | 25 | | | | | | | | | | | |
| | 26 | 5 | SS | | | 12 | 16 | | | GA | gy brn sandy gravel, subang gravel | mostly |
| | 27 | | | | | | | | | | med fn gr. - co-vfn sand to silt | Saturated |
| | 28 | | | | | | | | | | predom. carbonate gravel - some igneous 5-10% | |

Donohue**DRILLING DATA**SOIL BORING NUMBER

Engineers & Architects

ADDITIONAL DRILLING DATA

Split Tube Size ID OD
 Hammer Wt. 146 lb 30 in drop
 Thin Wall Tube Size OD
 Casing Used LF Dia.
 Casing Hammer lb in drop
 Drill Rod Size
 Drill Bit Type (a) (b)
 Drill Bit Size (a) (b)
 Auger Type 6 3/4 OD
 Hollow Stem Auger 4 1/2 ID
 Core Barrel Size ID Length
 Core Bit Serial
 Core Bit Serial
 Drill Mud Type
 Drill Mud Formula
 Depth Drill Mud Used
 Back Filled Date
 Method by
 Drill Rig Mfg. Mod.
 Other Equip.
 Other Equip.

DRILLING INFORMATION

- Record measurements in tenths of feet.
- For samples, record sample type (split spoon, Shelby, core) depths, sample interval, length of sample recovered.
- Record first encountered water and any other distinct water producing zones.
- Record blow counts (density), hammer weight, length of fall for driven samples.
- Record use of drilling fluids, fluid type, source of water, fluid losses, interval (and soil type) where fluid loss occurred, if determinable, quantitative estimate of volume of fluid loss.
- Record drilling equipment used and general drilling procedures.
- Record all problems encountered during drilling.
- Collect samples of backfill, gravel, and concrete.
- Report general drilling conditions (temperature, raining, etc.)

Soil/Rock Description Requirements

- Soil
 - Written classification
 - USCS symbol
 - Estimated % of secondary components *% and size gravel, cobbles
 - Color, mottling
 - Plasticity (general)
 - Consistency (cohesive) or density (non-cohesive)
 - Moisture
 - Texture/fabric/banding
 - Depositional environment
- Rock
 - Classification
 - Lithologic characteristics
 - Banding/banding
 - Color
 - Hardness
 - Degree of cementation
 - Texture
 - Structure
 - Degree of weathering
 - Solution or void conditions
 - Primary and secondary estimated hydraulic conductivity, rationale
 - Note natural and coring induced rock breaks, and list core including probable reason for. Include number of fractures per foot, number of fractures per total length of recovery.

| <u>Texture</u> | <u>Abbreviation</u> | <u>Size</u> | <u>Abbreviation</u> | <u>Soil Particle Size</u> |
|----------------|---------------------|--------------------------|---------------------|---|
| Boulder | Bo | | | Over 3.0" |
| Gravel | Gr | Large Medium Small | L M Sm | 1.0" to 3.0" .38" to .99" 2.0mm to .38" |
| Sand | S | Coarse Medium Fine | Co M F | .75mm to 1.99mm .25mm to .74mm .05mm to .24mm |
| Silt | Si | | | .002mm to .049mm |
| Clay | C | | | Smaller than .022mm |

| <u>Consistency</u> | <u>Abbreviation</u> | <u>N</u> | <u>Density</u> | <u>Abbreviation</u> | <u>N</u> |
|--------------------|---------------------|----------|----------------|---------------------|----------|
| Very Soft | VS | 0-2 | Very Loose | VL | 0-4 |
| Soft | S | 3-4 | Loose | L | 5-9 |
| Medium | M | 5-8 | Medium Dense | MD | 10-29 |
| Stiff | St | 9-16 | Dense | D | 30-49 |
| Very Stiff | VST | 17-30 | Very Dense | VD | 50+ |
| Hard | H | Over 30 | | | |

| <u>% of Dry Weight</u> | <u>Term</u> | <u>Abbreviation</u> |
|------------------------|---------------------|---------------------|
| 0-10 | Trace or Occasional | TR or OC |
| 11-20 | Little | LI |
| 21-35 | Some | SO |
| 36-50 | And or With | & or W/ |

CONDITIONS FOR USE OF SOIL BORING LOG

This field soil boring log records the soil descriptions and other data observed or measured in the field by qualified soil technicians. The soils between the samples may have been determined by the "feel" of the drill bit or wash cuttings. The changes between the soil strata may be transitional rather than abrupt, particularly with respect to color, weathering, and consistency changes. The amount of large sized gravel or boulders is generally estimated because the sampling tubes seldom retain these larger sized soil particles. Delayed readings of ground water levels may not be entered on this field log.

Donohue

BORING LOG

SOIL BORING NO.

Engineers & Architects

SITE: U.S.A.R.C. PROJECT NO. _____

112-74

Piezomètre

DRILLING METHOD: Hollow Stem Auger

WATER LEVEL READINGS

GROUND SURFACE ELEV.

FOREMAN: John

| DATE | TIME | DEPTH |
|------|------|-------|
|------|------|-------|

PHYSICAL SETTING: flat / grassy meadow

ASSISTANT; B. 6

DATE START: 11-22-88

GEOL./ENG'R. J. Girard

DATE COMPLETE: 11-23-88

LOG BY: J. Girard

| DEPTH TO CHANGES IN STRATA | DEPTH IN FEET | SAMPLING DATA | | | | | | USCS | SOIL DESCRIPTION | COMMENTS | |
|----------------------------------|------------------|---------------|----|---|---|-------------|-----|------|------------------|--|---------|
| | | NO. | T | A | R | PENETRATION | | | | | |
| | | | | | | 1st | 2nd | | | | 3rd |
| | 25 | | | | | | | | | | |
| | 26 | | | | | | | | | crunchy drilling | |
| | 27 | | | | | | | | | | |
| | 28 | | | | | | | | | | |
| | 29 | | | | | | | | | | |
| | 30 | 6 | SS | | | 10' | 9" | 24 | GM | gray brn sandy gravel 90% gravel. subang. L.S. R 5% igneous, 20% co. vfn sand trace silt. | Same as |
| | 31 | | | | | | | | | | |
| | 32 | | | | | | | | | | |
| | 33 | | | | | | | | | | |
| | 34 | | | | | | | | | | |
| | 35 | 7 | SS | | | 10' | 10" | 14 | GM | gray sandy gravel 90% gravel co-fn granule - 10% fn-vfn sand. problem L.S. frags. gravel subang to subra | same as |
| | 36 | | | | | | | | | | |
| | 37 | | | | | | | | | | |
| | 38 | | | | | | | | | | |
| | 39 | | | | | | | | | | |
| | 40 | 8 | SS | | | 10' | 17" | 17 | GM | gray brn sandy gravel. 70% gravel co-fn. rad - to subang. more rounded than above 20% granule, 10% co-fn sand. also L.S. gravel, 5% igneous | Same as |
| | 41 | | | | | | | | | | |
| | 42 | | | | | | | | | | |
| | 43 | | | | | | | | CL | gray silty clay with co gravel to cobbles gravel rad-subrad. little sand. | |
| | 44 | | | | | | | | | | |
| | 45 | | | | | | | | | | |
| | 46 | 9 | SS | | | 6' | 60" | | SM | gray gravelly sand fn-CS some fine gravel to granule Bedrock @ ~ 45 1/2 feet. could not penetrate with spoon. | |
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| | 100 | | | | | | | | | | |

ADDITIONAL DRILLING DATA

Split Tube Size ID OD
 Hammer Wt. 140 lb 30 in drop
 Thin Wall Tube Size OD
 Casing Used LF Dia.
 Casing Hammer lb in drop
 Drill Rod Size
 Drill Bit Type (a) (b)
 Drill Bit Size (a) (b)
 Auger Type 63 OD
 Hollow Stem Auger 44 ID
 Core Barrel Size ID Length
 Core Bit Serial
 Core Bit Serial
 Drill Mud Type
 Drill Mud Formula
 Depth Drill Mud Used
 Back Filled Data
 Method by
 Drill Rig Mfg. Mod.
 Other Equip.
 Other Equip.

DRILLING INFORMATION

- Record measurements in tenths of feet.
- For samples, record sample type (split spoon, Shelby, core) depths, sample interval, length of sample recovered.
- Record first encountered water and any other distinct water producing zones.
- Record blow counts (density), hammer weight, length of fall for driven samples.
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Soil/Rock Description Requirements

- Soil
 - Written classification
 - USCS symbol
 - Estimated % of secondary components *% and also gravel, cobbles
 - Color, mottling
 - Plasticity (general)
 - Consistency (cohesive) or density (non-cohesive)
 - Moisture
 - Texture/structure/banding
 - Depositional environment
- Rock
 - Classification
 - Lithologic characteristics
 - Bedding/banding
 - Color
 - Hardness
 - Degree of cementation
 - Texture
 - Structure
 - Degree of weathering
 - Solution or void conditions
 - Primary and secondary estimated hydraulic conductivity, rationale
 - Note natural and saving induced rock breaks, and test core including probable reason for, include number of fractures per foot, number of fractures per total length of recovery.

| <u>Texture</u> | <u>Abbreviation</u> | <u>Size</u> | <u>Abbreviation</u> | <u>Soil Particle Size</u> |
|----------------|---------------------|--------------------------|---------------------|---|
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| Gravel | Gr | Large Medium Small | L M Sm | 1.0" to 3.0" .38" to .99" 2.0mm to .38" |
| Sand | S | Coarse Medium Fine | Co M F | .75mm to 1.99mm .25mm to .74mm .05mm to .24mm |
| Silt | Si | | | .002mm to .049mm |
| Clay | C | | | Smaller than .022mm |

| <u>Consistency</u> | <u>Abbreviation</u> | <u>N</u> | <u>Density</u> | <u>Abbreviation</u> | <u>N</u> |
|--------------------|---------------------|----------|----------------|---------------------|----------|
| Very Soft | VS | 0-2 | Very Loose | VL | 0-4 |
| Soft | S | 3-4 | Loose | L | 5-9 |
| Medium | M | 5-8 | Medium Dense | MD | 10-29 |
| Stiff | St | 9-16 | Dense | D | 30-49 |
| Very Stiff | VST | 17-30 | Very Dense | VD | 50+ |
| Hard | H | Over 30 | | | |

| <u>% of Dry Weight</u> | <u>Term</u> | <u>Abbreviation</u> |
|------------------------|---------------------|---------------------|
| 0-10 | Trace or Occasional | TR or OC |
| 11-20 | Little | LI |
| 21-35 | Some | SO |
| 36-50 | And or With | & or W/ |

CONDITIONS FOR USE OF SOIL BORING LOG

This field soil boring log records the soil descriptions and other data observed or measured in the field by qualified soil technicians. The soils between the samples may have been determined by the "feel" of the drill bit or wash cuttings. The changes between the soil strata may be transitional rather than abrupt, particularly with respect to color, weathering, and consistency changes. The amount of large sized gravel or boulders is generally estimated because the sampling tubes seldom retain these larger sized soil particles. Delayed readings of ground water levels may not be entered on this field log.

Donohue**BORING LOG**

SOIL BORING NO.

Engineers & Architects
COMPUTER AIDED DESIGN/DTGSITE: U.S.A.R.C. PROJECT NO. 15977.007

(DW-113) B

November 14, 1988

DRILLING METHOD: Auger - Hollow Stem

WATER LEVEL READINGS

GROUND SURFACE ELEV. _____

FOREMAN: Gary WellnerDATE 11-14 TIME 3:30 DEPTH 14.21 W.D.PHYSICAL SETTING: flat / low LASSISTANT: Neil

11-14 4:25 11.77 S.C.R.

DATE START: 11-14-88GEOLOGICAL/ENGINEER: Joel Giraud

11-15 6:45 AM 9.89 A.C.R.

DATE COMPLETE: 11-16-88LOG BY: J. Giraud

11-15 1:00 PM 8.99 HPS A.D.

11-16 2:15 AM 8.92 HPS A.D.

| DEPTH TO CHANGES IN STRATA | DEPTH IN FEET | SAMPLING DATA | | | | | | | USCS | SOIL DESCRIPTION | COMMENTS |
|----------------------------|---------------|---------------|----|---|---|-------------|-----|-----|-------|--|------------------------------|
| | | NO. | T | A | R | PENETRATION | | | | | |
| | | | | | | 100 | 200 | 300 | | | |
| | 1 | | | | | | | | ML | dk brown clayey sand 10% silt, moist | |
| | 2 | | | | | | | | ML SM | brn silty sand, red gravel to cobbles of 1" depth. limestone | coarse material |
| | 3 | | | | | | | | ML | lt brn silty sand & 5% gravel round to sub round. dry/chalky. | |
| | 4 | | | | | | | | ML | lt brn silty sand, vfn sand no co. fraction. dry | |
| | 5 | | | | | | | | ML | br silty sand 10-20% clay | |
| | 6 | | | | | | | | ML | gy brn, clayey sand, shells-up | |
| | 7 | | | | | | | | CL | sandy silty clay, gy brn sand fine & 5% med. trace moisture | |
| | 8 | | | | | | | | CL | gy brn silty clay. | |
| | 9 | | | | | | | | CL | gy brn clayey silt tr. co. med sand tr round granules. wet/moist. | easier drilling at 9' |
| | 10 | | | | | | | | CL | gy brn silty clay trace med fn sand trace granules | ? with table |
| | 11 | 1 | SS | | | 1' 4 7/8 | | | CL | gy sandy silty clay fn-med sand trace fn gravel med. moist | gravelly crunchy drilling |
| | 12 | 1 | SS | | | | | | CL | gy sand - 1" recovery calcareous gy silty clay | |
| | 13 | | | | | | | | CL | gy sandy silty clay muddy cuttings - very fluid | easier drilling 13-15' |
| | 14 | | | | | | | | CL | gy silty clay muddy - more fluid | |
| | 15 | | | | | | | | CL | gy silty sandy clay | |
| | 16 | 2 | SS | | | 1' 4 3/4 | | | SM | gy silty gravelly sand carbonaceous sand tr. siliceous sand, saturated, ang. limestone, co. med sand | crunchy at base |
| | 17 | 2 | SS | | | | | | SM | " " | crunchy |
| | 18 | | | | | | | | | gy silty sand: muddy up auger flight - non representative. | |
| | 19 | | | | | | | | | Clayey saturated | |
| | 20 | | | | | | | | | Clayey saturated | |
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Advanced borehole to 20'. Clays unweaving in auger - flushed with clean water to remove cuttings.

Based on water level at 10-11' decided to place screen from 8 to 18'.

Donohue

Engineers & Architects

DRILLING DATASHEET OF

SOIL BORING NUMBER

ADDITIONAL DRILLING DATA

Split Tube Size ID OD
 Hammer Wt. 140 lb 30 in drop
 Thin Wall Tube Size OD
 Casing Used LF Dis.
 Casing Hammer lb in drop
 Drill Rod Size
 Drill Bit Type (a) (b)
 Drill Bit Size (a) (b)
 Auger Type 6 3/4 OD
 Hollow Stem Auger 4 1/2 ID
 Core Barrel Size ID Length
 Core Bit Serial
 Core Bit Serial
 Drill Mud Type
 Drill Mud Formula
 Depth Drill Mud Used
 Back Filled Date
 Method by
 Drill Rig Mfg. Mod.
 Other Equip.
 Other Equip.

DRILLING INFORMATION

1. Record measurements in tenths of feet.
2. For samples, record sample type (split spoon, Shelby, core) depth, sample interval, length of sample recovered.
3. Record first encountered water and any other distinct water producing zones.
4. Record blow counts (density), hammer weight, length of fall for driven samples.
5. Record use of drilling fluids, fluid type, source of water, fluid losses, intervals (and soil type) where fluid loss occurred, if determinable, quantitative estimates of volume of fluid loss.
6. Record drilling equipment used and general drilling procedures.
7. Record all problems encountered during drilling.
8. Collect samples of backfill, grout, and concrete.
9. Report general drilling conditions: (temperature, raining, etc.)

Soil/Wash Description Requirements

1. Soil
 - a. Written classification
 - b. USCS symbol
 - c. Estimated % of secondary components: % and size gravel, cobbles
 - d. Color, mottling
 - e. Plasticity (general)
 - f. Cohesiveness (cohesive) or density (non-cohesive)
 - g. Moisture
 - h. Texture/texture/texture
 - i. Depositional environment
2. Rock
 - a. Classification
 - b. Lithologic characteristics
 - c. Bedding/banding
 - d. Color
 - e. Hardness
 - f. Degree of cementation
 - g. Texture
 - h. Structure
 - i. Degree of weathering
 - j. Solution or void conditions
 - k. Primary and secondary estimated hydraulic conductivity, rationale
 - l. Note natural and searing induced rock breaks, and test core including probable reason for. Include number of fractures per foot, number of fractures per total length of recovery.

| Texture | Abbreviation | Size | Abbreviation | Soil Particle Size |
|---------|--------------|--------------------------|--------------|---|
| Boulder | Bo | | | Over 3.0" |
| Gravel | Gr | Large Medium Small | L M Sm | 1.0" to 3.0" .38" to .99" 2.0mm to .38" |
| Sand | S | Coarse Medium Fine | Co M F | .75mm to 1.99mm .25mm to .74mm .05mm to .24mm |
| Silt | Si | | | .002mm to .049mm |
| Clay | C | | | Smaller than .002mm |

| Consistency | Abbreviation | N | Density | Abbreviation | N |
|-------------|--------------|---------|--------------|--------------|-------|
| Very Soft | VS | 0-2 | Very Loose | VL | 0-4 |
| Soft | S | 3-4 | Loose | L | 5-9 |
| Medium | M | 5-8 | Medium Dense | MD | 10-29 |
| Stiff | St | 9-16 | Dense | D | 30-49 |
| Very Stiff | VST | 17-30 | Very Dense | VD | 50+ |
| Hard | H | Over 30 | | | |

| % of Dry Weight | Term | Abbreviation |
|-----------------|---------------------|--------------|
| 0-10 | Trace or Occasional | TR or OC |
| 11-20 | Little | LI |
| 21-35 | Some | SO |
| 36-50 | And or With | & or W/ |

CONDITIONS FOR USE OF SOIL BORING LOG

This field soil boring log records the soil descriptions and other data observed or measured in the field by qualified soil technicians. The soils between the samples may have been determined by the "feel" of the drill bit or wash cuttings. The changes between the soil strata may be transitional rather than abrupt, particularly with respect to color, weathering, and consistency changes. The amount of large sized gravel or boulders is generally estimated because the sampling tubes seldom retain these larger sized soil particles. Delayed readings of ground water levels may not be entered on this field log.

ADDITIONAL DRILLING DATA

Split Tube Size _____ ID _____ OD _____
 Hammer Wt. 140 lb 30 in drop
 Thin Wall Tube Size _____ OD _____
 Casing Used _____ LF _____ Dia. _____
 Casing Hammer _____ lb _____ in drop
 Drill Rod Size _____
 Drill Bit Type _____ (a) _____ (b) _____
 Drill Bit Size _____ (a) _____ (b) _____
 Auger Type 6.75 OD _____
 Hollow Stem Auger 4.5 ID _____
 Core Barrel Size _____ ID _____ Length _____
 Core Bit Serial _____
 Core Bit Serial _____
 Drill Mud Type _____
 Drill Mud Formula _____
 Depth Drill Mud Used _____
 Back Filled Date _____
 Method _____ by _____
 Drill Rig Mfg. Mod. CME 55
 Other Equip. _____
 Other Equip. _____

DRILLING INFORMATION

1. Record measurements in lengths of feet.
2. For samples, record sample type (split spoon, Shelby, core) depths, sample interval, length of sample recovered.
3. Record first encountered water and any other distinct water producing zones.
4. Record blow counts (density), hammer weight, length of fall for driven samples.
5. Record use of drilling fluids, fluid type, source of water, fluid losses, interval (and soil type) where fluid loss occurred, if determinable, quantitative estimates of volume of fluid loss.
6. Record drilling equipment used and general drilling procedures.
7. Record all problems encountered during drilling.
8. Collect samples of backfill, grout, and concrete.
9. Report general drilling conditions: (temperature, raining, etc.)

Soil/Rock Description Requirements

1. Soil
 - a. Written classification
 - b. USCS symbol
 - c. Estimated % of secondary components *% and size gravel, cobbles
 - d. Color, mottling
 - e. Plasticity (general)
 - f. Consistency (cohesive) or density (non-cohesive)
 - g. Moisture
 - h. Temperature/season
 - i. Depositional environment
2. Rock
 - a. Classification
 - b. Lithologic characteristics
 - c. Bedding/bonding
 - d. Color
 - e. Hardness
 - f. Degree of cementation
 - g. Texture
 - h. Structure
 - i. Degree of weathering
 - j. Selection of void conditions
 - k. Primary and secondary estimated hydraulic conductivity, rationale
 - l. Note natural and coring induced rock breaks, and test core including probable reason for. Include number of fractures per foot, number of fractures per total length of recovery.

| Texture | Abbreviation | Size | Abbreviation | Soil Particle Size |
|---------|--------------|--------------------------|--------------|---|
| Boulder | Bo | | | Over 3.0" |
| Gravel | Gr | Large Medium Small | L M Sm | 1.0" to 3.0" .38" to .99" 2.0mm to .38" |
| Sand | S | Coarse Medium Fine | Co M F | .75mm to 1.99mm .25mm to .74mm .05mm to .24mm |
| Silt | Si | | | .002mm to .049mm |
| Clay | C | | | Smaller than .002mm |

| Consistency | Abbreviation | N | Density | Abbreviation | N |
|-------------|--------------|---------|--------------|--------------|-------|
| Very Soft | VS | 0-2 | Very Loose | VL | 0-4 |
| Soft | S | 3-4 | Loose | L | 5-9 |
| Medium | M | 5-8 | Medium Dense | MD | 10-29 |
| Stiff | St | 9-16 | Dense | D | 30-49 |
| Very Stiff | VST | 17-30 | Very Dense | VD | 50+ |
| Hard | H | Over 30 | | | |

| % of Dry Weight | Term | Abbreviation |
|-----------------|---------------------|--------------|
| 0-10 | Trace or Occasional | TR or OC |
| 11-20 | Little | LI |
| 21-35 | Some | SO |
| 36-50 | And or With | & or W/ |

CONDITIONS FOR USE OF SOIL BORING LOG

This field soil boring log records the soil descriptions and other data observed or measured in the field by qualified soil technicians. The soils between the samples may have been determined by the "feel" of the drill bit or wash cuttings. The changes between the soil strata may be transitional rather than abrupt, particularly with respect to color, weathering, and consistency changes. The amount of large sized gravel or boulders is generally estimated because the sampling tubes seldom retain these larger sized soil particles. Delayed readings of ground water levels may not be entered on this field log.

Donohue

BORING LOG

SOIL BORING NO.

Engineers & Architects

SITE: U.S.A.R.C PROJECT NO. 15977.007

(P-113) A

DRILLING METHOD: Auger - Hollow Stem

FOREMAN Gary Wellner

ASSISTANT: Neil

GEOLOGICAL ENGINEER Joe Girard

LOG BY: J Girard

WATER LEVEL READINGS

| DATE | TIME | DEPTH | |
|-------|-------|-------|-----------|
| _____ | _____ | _____ | W.D. |
| _____ | _____ | _____ | S.C.R. |
| _____ | _____ | _____ | A.C.R. |
| _____ | _____ | _____ | HPS. A.D. |
| _____ | _____ | _____ | HPS. A.D. |

GROUND SURFACE ELEV.

PHYSICAL SETTING: flat / gentle slopes

DATE START: 11-15-88

DATE COMPLETE: 11-16-88

| DEPTH TO CHANGES IN STRATA | DEPTH IN FEET | SAMPLING DATA | | | | | | | USCS | SOIL DESCRIPTION | COMMENTS | |
|----------------------------------|------------------|---------------|----|---|---|-------------|-------|-----|------|---|----------|---|
| | | NO. | T | A | R | PENETRATION | | | | | | |
| | | | | | | 1st | 2nd | 3rd | | | | N |
| 27 | | | | | | | | | | | | |
| 28 | | | | | | | | | | | | |
| 29 | | | | | | | | | | | | |
| 30 | | | | | | | | | | | | |
| 31 | | 6 | SS | | | 2 7/8 | 12/15 | | CL | gs to brn grey clay trace silt very plastic | | |
| 32 | | 6 | | | | | | | CL | gs to brn grey clay | | |
| 33 | | | | | | | | | | | | |
| 34 | | | | | | | | | | | | |
| 35 | | | | | | | | | | | | |
| 36 | | | | | | | | | | | | |
| 37 | | | | | | | | | | | | |
| 38 | | | | | | | | | | | | |
| 39 | | | | | | | | | | | | |
| 40 | | | | | | | | | | | | |
| 41 | | 7 | SS | | | 1 | 25/55 | | SP | brn grey med sand, well sorted saturated clams. 0.5' | | |
| 42 | | 7 | | | | | | | CL | 0.5' bottom @ 40.5' grey to brn grey med sand @ 41' | | |
| 43 | | | | | | | | | | | | |
| 44 | | | | | | | | | | | | |
| 45 | | 8 | SS | | | .5 | 50 | | | clay recovery - no giving, possibly bedrock | | |

Donohue

Engineers & Architects

DRILLING DATASHEET OF SOIL BORING NUMBER **ADDITIONAL DRILLING DATA**

Split Tube Size ID OD
 Hammer Wt. 140 lb 30 in drop
 Thin Wall Tube Size OD
 Casing Used LF Dia.
 Casing Hammer lb in drop
 Drill Rod Size
 Drill Bit Type (a) (b)
 Drill Bit Size (a) (b)
 Auger Type OD
 Hollow Stem Auger ID
 Core Barrel Size ID Length
 Core Bit Serial
 Core Bit Serial
 Drill Mud Type
 Drill Mud Formula
 Depth Drill Mud Used
 Back Filled Date
 Method Jy
 Drill Rig Mfg. Mod.
 Other Equip.
 Other Equip.

DRILLING INFORMATION

- Record measurements in tenths of feet.
- For samples, record sample type (split spoon, Shelby, core) depths, sample interval, length of sample recovered.
- Record first encountered water and any other distinct water producing zones.
- Record blow counts (density), hammer weight, length of fall for driven samples.
- Record use of drilling fluids, fluid type, source of water, fluid losses, interval (and soil type) where fluid loss occurred, if determinable, quantitative estimate of volume of fluid lost.
- Record drilling equipment used and general drilling procedures.
- Record all problems encountered during drilling.
- Collect sample of washfill, gravel, and cuttings.
- Report general drilling conditions: (temperature, raining, etc.)

Soil/Rock Description Requirements

- Soil**
 - Written classification
 - USCS symbol
 - Estimated % of secondary components: % and size gravel, cobbles
 - Color, mottling
 - Plasticity (general)
 - Consistency (cohesive) or density (non-cohesive)
 - Moisture
 - Texture/fabric/grading
 - Geopositional environment
- Rock**
 - Classification
 - Lithologic characteristics
 - Bedding/banding
 - Color
 - Hardness
 - Degree of cementation
 - Texture
 - Structure
 - Degree of weathering
 - Solution or void conditions
 - Primary and secondary estimated hydraulic conductivity, rationale
 - Note natural and coring induced rock breaks, and test core including probable reason for. Include number of fractures per foot, number of fractures per total length of recovery.

| Texture | Abbreviation | Size | Abbreviation | Soil Particle Size |
|---------|--------------|--------|--------------|---------------------|
| Boulder | Bo | | | Over 3.0" |
| Gravel | Gr | Large | L | 1.0" to 3.0" |
| | | Medium | M | .38" to .99" |
| | | Small | Sm | 2.0mm to .38" |
| Sand | S | Coarse | Co | .75mm to 1.99mm |
| | | Medium | M | .25mm to .74mm |
| | | Fine | F | .05mm to .24mm |
| Silt | Si | | | .002mm to .049mm |
| Clay | C | | | Smaller than .002mm |

| Consistency | Abbreviation | N | Density | Abbreviation | N |
|-----------------|--------------|---------------------|--------------|--------------|-------|
| Very Soft | VS | 0-2 | Very Loose | VL | 0-4 |
| Soft | S | 3-4 | Loose | L | 5-9 |
| Medium | M | 5-8 | Medium Dense | MD | 10-29 |
| Stiff | St | 9-16 | Dense | D | 30-49 |
| Very Stiff | VST | 17-30 | Very Dense | VD | 50+ |
| Hard | H | Over 30 | | | |
| % of Dry Weight | | Term | | Abbreviation | |
| 0-10 | | Trace or Occasional | | TR or OC | |
| 11-20 | | Little | | LI | |
| 21-35 | | Somewhat | | SO | |
| 36-50 | | And or With | | & or W/ | |

CONDITIONS FOR USE OF SOIL BORING LOG

This field soil boring log records the soil descriptions and other data observed or measured in the field by qualified soil technicians. The soils between the samples may have been determined by the "feel" of the drill bit or wash cuttings. The changes between the soil strata may be transitional rather than abrupt, particularly with respect to color, weathering, and consistency changes. The amount of large sized gravel or boulders is generally estimated because the sampling tubes seldom retain these larger sized soil particles. Delayed readings of ground water levels may not be entered on this field log.

APPENDIX B
TWIN CITY TESTING BORING LOGS

LOG OF TEST BORING

JOB NO. 8100-89-0181 VERTICAL SCALE 1" = 6' BORING NO. OW112B
 PROJECT MW INSTALLATION PROJECT, DEPARTMENT OF THE ARMY, MILWAUKEE, WISCONSIN

| DEPTH IN FEET | DESCRIPTION OF MATERIAL | GEOLOGIC ORIGIN | N | WL | SAMPLE | | LABORATORY TESTS | | | |
|---------------------|---|--------------------|---|----|--------|------|------------------|---|--------------|----|
| | | | | | NO. | TYPE | W | D | L.L. P.L. | Qu |
| | ↓ SURFACE ELEVATION <u>691.54</u> | | | | | | | | | |
| 1 | ORGANIC SILTY CLAY, dark brown (OL) | TOPSOIL | | | | | | | | |
| | SILTY CLAY, brown (CL-ML) | FINE ALLUVIUM | | | | | | | | |
| 5 | SANDY SILT, with gravel, brown (ML) | | | | | | | | | |
| 9 | SILTY CLAY, with gravel, cobbles, brown to gray (CL-ML) | | | | | | | | | |
| 15 | SAND, with gravel, cobbles, gray, moist to wet (SP) | COARSE ALLUVIUM | | ▼ | | | | | | |
| 25 | END OF BORING | | | | | | | | | |

WATER LEVEL MEASUREMENTS

START 11-17-88 COMPLETE 11-17-88

| DATE | TIME | SAMPLED DEPTH | CASING DEPTH | CAVE-IN DEPTH | BAILED DEPTHS | WATER LEVEL | METHOD | |
|-------|-------|------------------|-----------------|------------------|---------------|----------------|-------------------|---------|
| 11-18 | 13:00 | -- | -- | -- | to | 18.0 | | 13:55 |
| | | | | | to | | 4½" HSA 0' to 25' | |
| | | | | | to | | | |
| | | | | | to | | | |
| | | | | | | | CREW CHIEF | WELLNER |

LOG OF TEST BORING

JOB NO. 8100-89-0181 VERTICAL SCALE 1" = 6' BORING NO. P112A
 PROJECT MW INSTALLATION PROJECT, DEPARTMENT OF THE ARMY, MILWAUKEE, WISCONSIN

| DEPTH IN FEET | DESCRIPTION OF MATERIAL | GEOLOGIC ORIGIN | N | WL | SAMPLE | | LABORATORY TESTS | | | |
|---------------------|---|--------------------------|-----|----|--------|------|------------------|---|------------|----|
| | | | | | NO. | TYPE | W | D | LL P.L. | Qu |
| | SURFACE ELEVATION <u>691.76</u> ORGANIC SILT, black (OL) LEAN CLAY, yellowish brown, stiff (CL) | TOPSOIL FINE ALLUVIUM | | | 1 | A | | | | |
| | | | | | 2 | A | | | | |
| | | | 25 | | 3 | SB | | | | |
| 8 1/2 | LEAN CLAY, with (See #1) | | | | | | | | | |
| 9 | SILTY CLAY, with gravel, cobbles, brown to gray, stiff (CL-ML) | | 21 | | 4 | SB | | | | |
| 15 | SAND, with gravel, medium grained, gray, moist, very dense (SM) | COARSE ALLUVIUM | 43 | | 5 | SB | | | | |
| 20 | SAND, with gravel, cobbles, gray, waterbearing, very dense, layers of sandy lean clay (SP) | | 44 | | 5 | SB | | | | |
| 25 | SAND, with gravel, medium to coarse grained, gray, dense to very dense, layers of silty sand (SP) | | 27 | | 7 | SB | | | | |
| | | | 32 | | 8 | SB | | | | |
| | | | 35 | | 9 | SB | | | | |
| | | | 33 | | 10 | SB | | | | |
| 43 | SILTY SAND, with gravel, gray, waterbearing, very dense (SM) | | 30 | | 11 | SB | | | | |
| 45 1/2 | END OF BORING | | 0.5 | | | | | | | |
| | #1 gravel, cobbles, brown, stiff (CL) | | | | | | | | | |


WATER LEVEL MEASUREMENTS

START 11-22-88 COMPLETE 11-23-88

| DATE | TIME | SAMPLED DEPTH | CASING DEPTH | CAVE-IN DEPTH | BAILED DEPTHS | WATER LEVEL | METHOD | TIME |
|-------|-------|---------------|--------------|---------------|---------------|-------------|----------------------|---------|
| 11-22 | 15:53 | 21 1/2' | 20' | 21 1/2' | 10 | 18 1/2' | 4 1/2" HSA 0' to 45' | 09:30 |
| | | | | | 10 | | | |
| | | | | | 10 | | | |
| | | | | | 10 | | | |
| | | | | | 10 | | | |
| | | | | | | | CREW CHIEF | WELLNER |

LOG OF TEST BORING

JOB NO. 8100-89-0181 VERTICAL SCALE 1" = 6' BORING NO. OW113B
 PROJECT MW INSTALLATION PROJECT, DEPARTMENT OF THE ARMY, MILWAUKEE, WISCONSIN

| DEPTH IN FEET | DESCRIPTION OF MATERIAL | GEOLOGIC ORIGIN | N | WL | SAMPLE | | LABORATORY TESTS | | | |
|---------------------|---|--------------------|----|----|--------|------|------------------|---|-----------------|----|
| | | | | | NO. | TYPE | W | D | $\frac{LL}{PL}$ | Qu |
| |  SURFACE ELEVATION <u>679.94</u> | | | | | | | | | |
| 6" | ORGANIC SILTY CLAY, dark brown (OL) | TOPSOIL | | | | | | | | |
| | SILTY SAND, light brown, moist (SM) | COARSE ALLUVIUM | | | | | | | | |
| 6 | SILTY CLAY, brown (CL-ML) | FINE ALLUVIUM | | | | | | | | |
| 10 | SILTY SAND, with gravel, gray, wet, medium dense (SM) | COARSE ALLUVIUM | 12 | | 1 | SB | | | | |
| | | | | | 2 | SB | | | | |
| 15 | SAND, medium grained, gray, water-bearing, loose (SP) | | 7 | | 3 | SB | | | | |
| 17 | SILTY CLAY, with gravel, gray (CL-ML) | FINE ALLUVIUM | | | | | | | | |
| 20 | END OF BORING | | | | | | | | | |

WATER LEVEL MEASUREMENTS

START 11-14-88 COMPLETE 11-15-88

| DATE | TIME | SAMPLED DEPTH | CASING DEPTH | CAVE IN DEPTH | BAILED DEPTHS | WATER LEVEL | METHOD | |
|-------|-------|---------------|--------------|---------------|---------------|-------------|-------------------|---------|
| 11-14 | 16:35 | 17' | 19' | 19' | 10 | 12' | | 08:30 |
| 11-15 | 07:00 | 20' | 20' | 20' | 10 | 9½' | 4½" HSA 0' to 20' | |
| | | | | | 10 | | | |
| | | | | | 10 | | | |
| | | | | | 10 | | | |
| | | | | | | | CREW CHIEF | WELLNER |

LOG OF TEST BORING

JOB NO. 8100-89-0181

VERTICAL SCALE 1" = 6'

BORING NO. P113A

PROJECT MW INSTALLATION PROJECT, DEPARTMENT OF THE ARMY, MILWAUKEE, WISCONSIN

| DEPTH IN FEET | DESCRIPTION OF MATERIAL | GEOLOGIC ORIGIN | N | WL | SAMPLE | | LABORATORY TESTS | | | |
|---------------------|--|----------------------------|------------|----|---------|----------|------------------|---|-------------|----|
| | | | | | NO | TYPE | W | D | L.L. P.L | Qu |
| | SURFACE ELEVATION <u>679.98</u> | | | | | | | | | |
| 9" | ORGANIC LEAN CLAY, dark brown (OL) | TOPSOIL | | | 1 | SB | | | | |
| 2 | ORGANIC LEAN CLAY, dark brown (OL) | FINE ALLUVIUM | 8 | | 2 | SB | | | | |
| | SILTY SAND, with gravel, light brown to brown, moist, loose (SM) | COARSE ALLUVIUM | | | | | | | | |
| 7 | SILTY CLAY, with sand, brown, medium (CL-ML) | FINE ALLUVIUM | 6 | ▼ | 3 | SB | | | | |
| 11 | SAND, with gravel, (See #1) | COARSE ALLUVIUM | 18 | | 4 | SB | | | | |
| 11½ | CLAYEY SAND, with gravel, (See #2) | FINE ALLUVIUM | | | | | | | | |
| 12 | SILTY CLAY, with gravel, gray, stiff, layers of sand (CL-ML) | FINE ALLUVIUM | | | | | | | | |
| 20 | SAND, with gravel, medium to coarse grained, gray, wet, dense (SP) | COARSE ALLUVIUM | 38 | | 5 | SB | | | | |
| 21½ | GRAVELLY LEAN CLAY, gray, very stiff (CL) | FINE ALLUVIUM | | | 6 | SB | | | | |
| 22 | SILTY CLAY, with sand, gray, very stiff (CL-ML) | ALLUVIUM | | | | | | | | |
| 25 | LEAN CLAY, a little gravel, grayish brown, very stiff (CL) | | 31 | | 7 | SB | | | | |
| | | | 26 | | 8 | SB | | | | |
| 40 | SANDY SILTY CLAY, a little gravel, gray, very stiff (CL-ML) | | 55 0.5' | | 9 10 | SB SB | | | | |
| 45 | END OF BORING | | 50 0.5' | | 11 | SB | | | | |
| | #1 coarse grained, gray, wet, dense (SP) | | | | | | | | | |
| | #2 gray, wet, dense (SC) | | | | | | | | | |

WATER LEVEL MEASUREMENTS

START 11-15-88 COMPLETE 11-15-88

| DATE | TIME | SAMPLED DEPTH | CASING DEPTH | CAVE IN DEPTH | BAILED DEPTHS | WATER LEVEL | METHOD | TIME |
|-------|------|---------------|--------------|---------------|---------------|-------------|-------------------|---------|
| 11-18 | 9:30 | -- | -- | -- | 10 | 8.2' | 4½" HSA 0' to 45' | 14:15 |
| | | | | | 10 | | | |
| | | | | | 10 | | | |
| | | | | | 10 | | | |
| | | | | | 10 | | | |
| | | | | | | | CREW CHIEF | WELLNER |

APPENDIX C
DONOHUE WELL CONSTRUCTION DIAGRAMS

X-section

Sheet ___ of ___

Donohue

OBSERVATION WELL INSTALLATION DIAGRAM

Site: USABC Training AreaDate: 11/27/88Well No. OW-112A flushBy: Jeff AndersonProject No. 15977.007

offset

flush

we

flush mount

3.2'

Protective Casing

Flush mount protector

Guard Posts

Type Steel

Vented

Diameter 4.0"

Locked

Length 3.0'

Key

well key #2016

Plug

ordered (now PVC temporary)

Type

Stainless steel

Vented

Concrete Collar

Quant. Cement 400 lbs. + Quant. Water 25 gal.Total Quant. gal.Manufacturer Quikrete

Seal

Powder/Granular/Pellets Quant. 10 gal. 2 gal. andManufacturer Pel PlugHydrated 12 gal., Time 40 min.

bag. 2:23

Pipe

Type Stainless SteelO.D. 2 1/4"Manufacturer Tri LocI.D. 2"Schedule 40Length/per sec. 1-10' No. of sec.

1-5'

Joints

Threaded Flush Joint

Tension Taped Yes/No

Type tension tape Threaded flushManufacturer OATEY (tape)

Backfill

Type(s) Red Flint + SandSource Silica #30Volume 7 - 100 lb bags (400 lbs)

Screen

Type Stainless SteelSlot Size 0.010"O.D. 2 1/4"No. Slots/ft. 100I.D. 2"Schedule 40Manufacturer Tri LocLength/per sec. 5' No. of sec. 2

Cap

Type

Material

8.0"

Notes: Water Source Original OW-112A was abandonedsince drillers metal measuring device was lost in the borehole. Offset 4.5' NW upgradient from abandoned hole

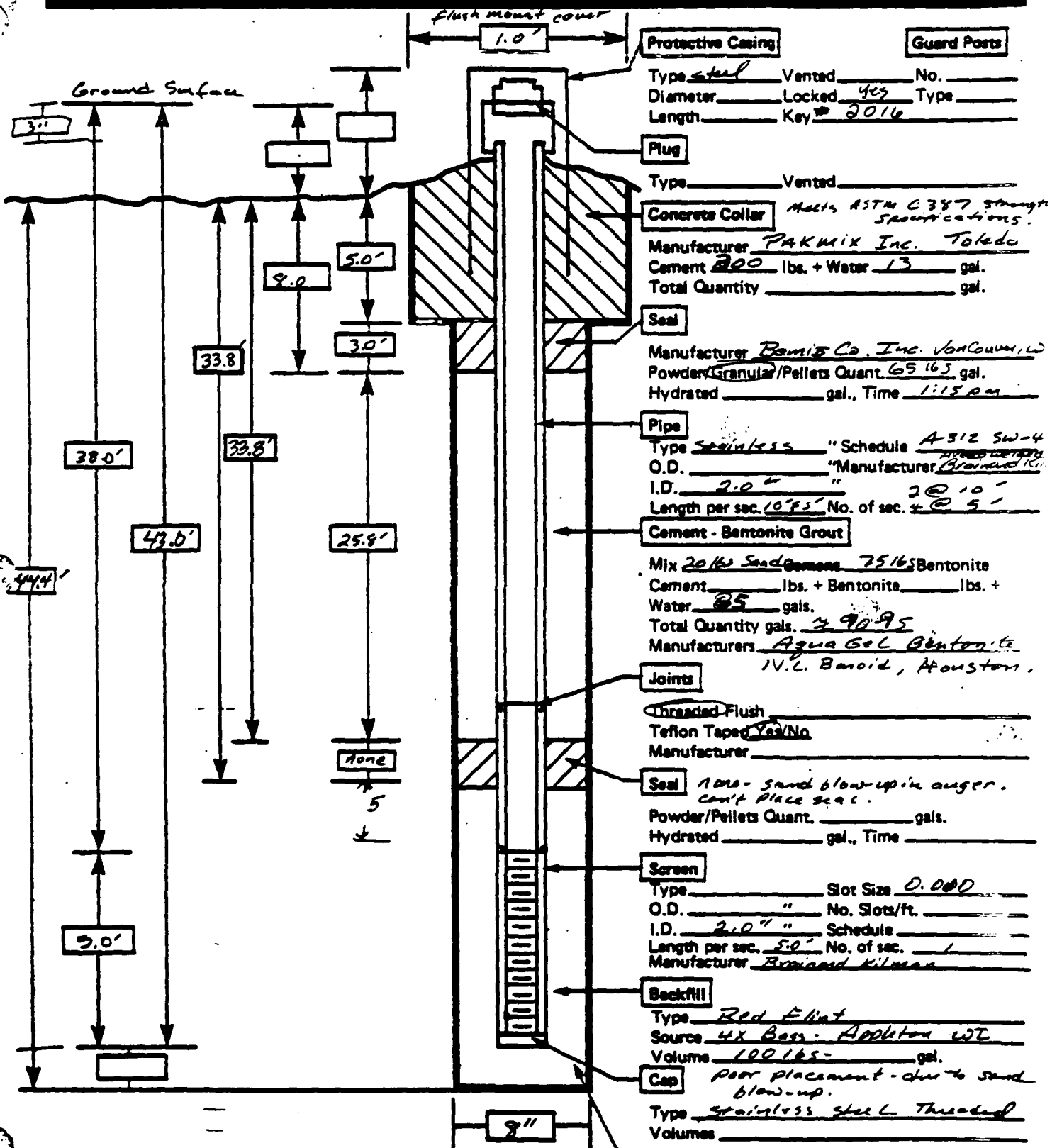
Donohue

PIEZOMETER INSTALLATION DIAGRAM

Sheet 1 of 1

Site: P-112A U.S.A.R.C. Date: 11-23-88
 By: J. Giraud Project No. 15977.007

Well No. P-112A



Notes: Water Source

U.S.A.R.C. - clean potable water Bldg 312

Donohue

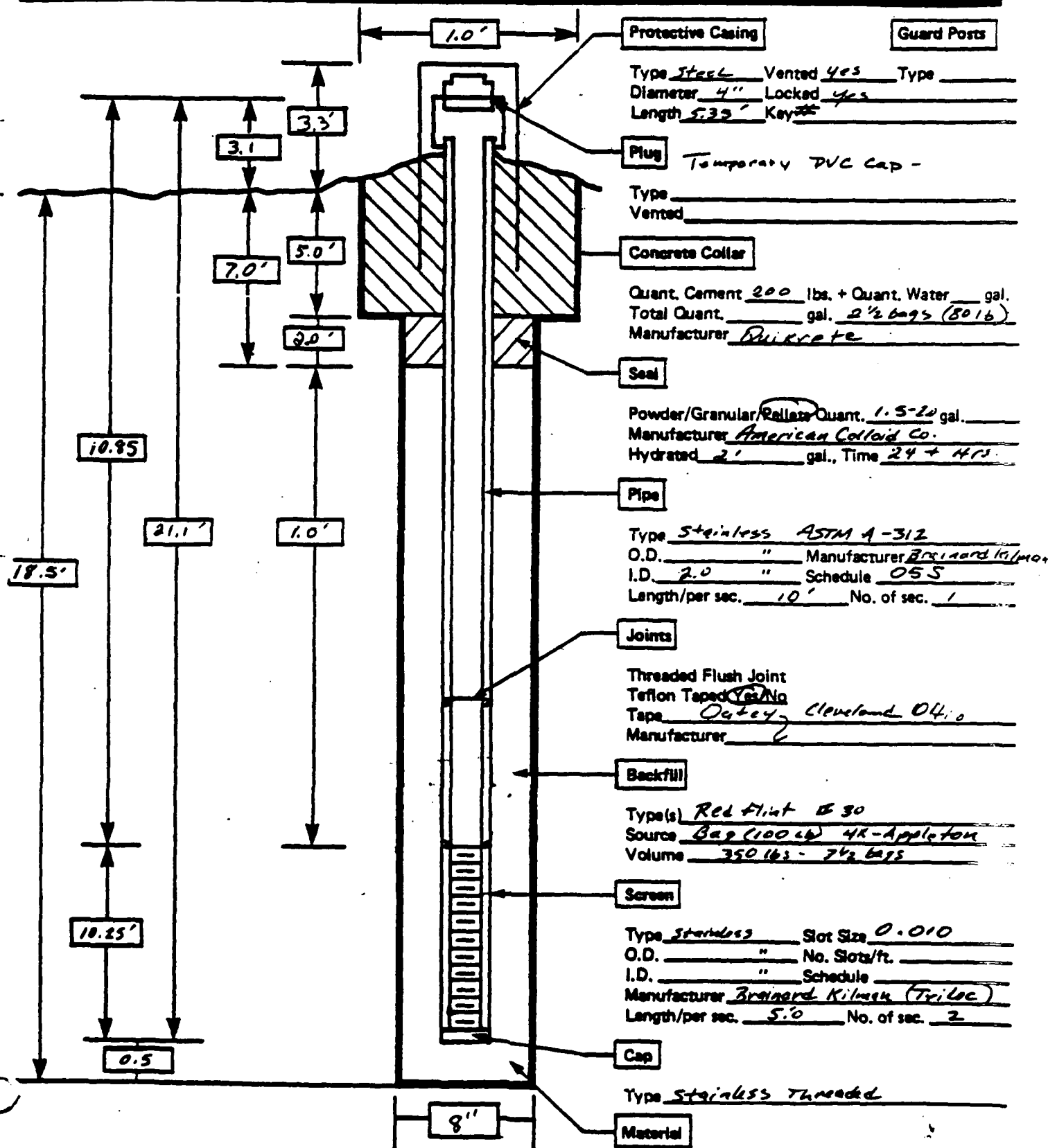
OBSERVATION WELL INSTALLATION DIAGRAM

Site: USARC (Milwaukee) Date: 11-15-88

Well No. 012-113B

By: JHL Girard

Project No. 15977.007



Notes: Water Source Bldg. 312 USARC

Drinking water

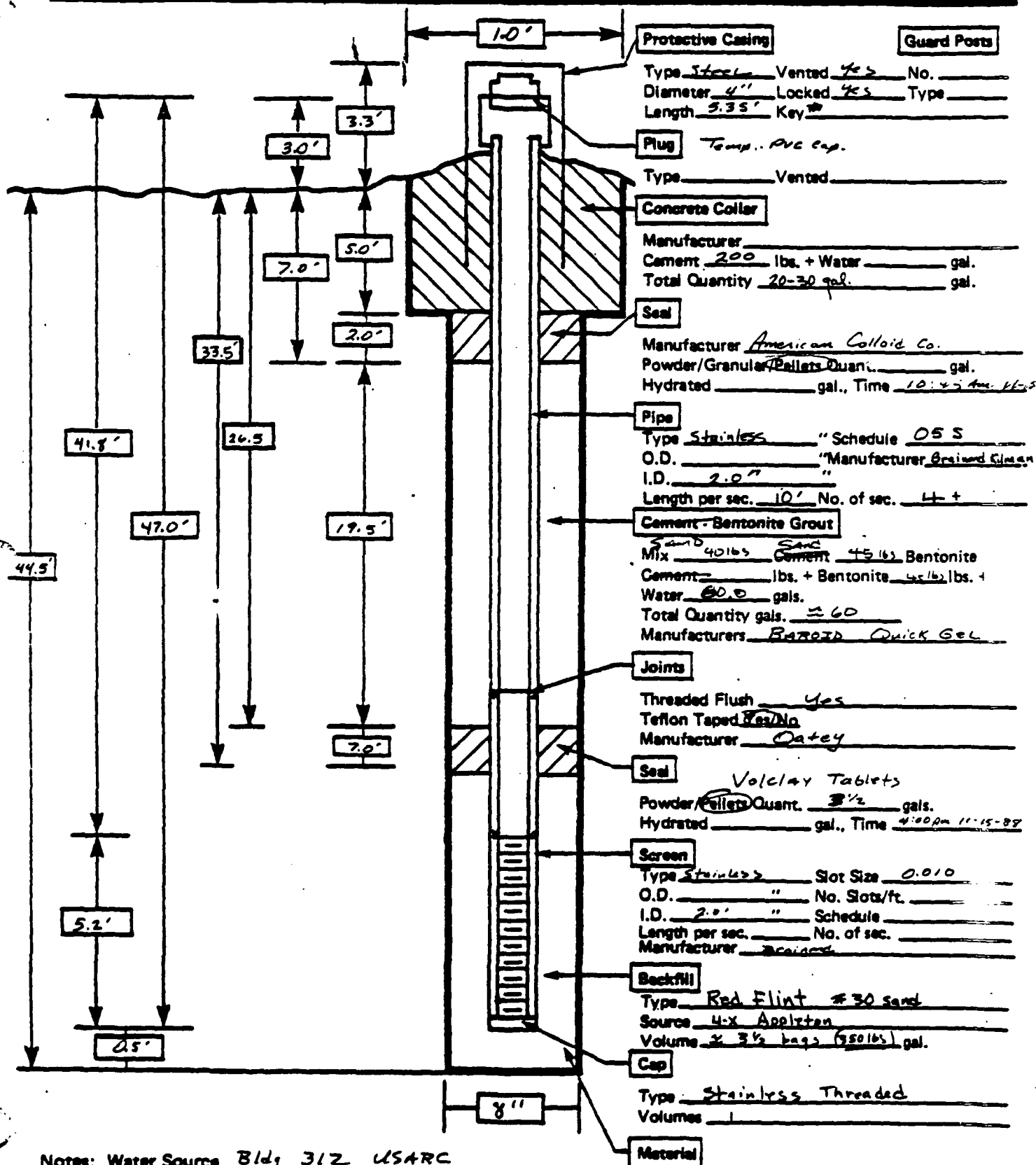
Donohue

PIEZOMETER INSTALLATION DIAGRAM

Sheet 1 of 1

Site: USARC Training Area Date: 11-15/86 - 88
By: J. Girard Project No. 15922.007

Well No. P-113 A



Notes: Water Source Bldg 312 USARC
Potable Water

APPENDIX D
TWIN CITY TESTING
WELL CONSTRUCTION DIAGRAMS

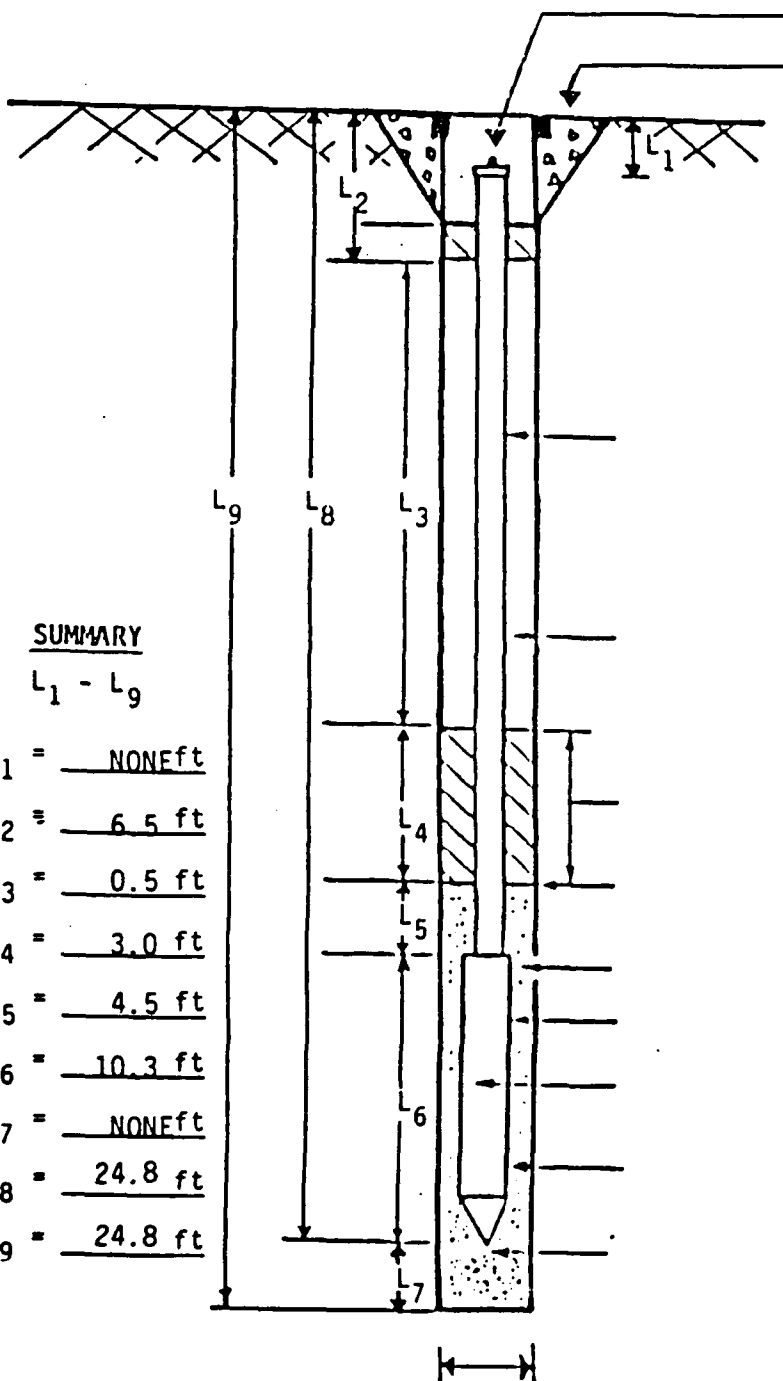
INSTALLATION OF FLUSH MOUNT MONITORING WELL

JOB NO. 8100-89-0181

MONITORING WELL NO. OW 112B

GROUND SURFACE ELEVATION 691.54

TOP OF RISER PIPR ELEVATION 691.36
(With cap removed)



| | |
|---|------------------------|
| SCREW TYPE CAP | |
| CONCRETE COLLAR | |
| PROTECTIVE FLUSH-MOUNT CASING | |
| Diameter and Type | 4" STEEL W/LOC |
| Total Length | 5.0' |
| Length Below Ground | 5.0' |
| THICKNESS AND TYPE OF SEAL | 6.5' CONCRETE |
| DIAMETER AND TYPE OF RISER PIPE | 2" STAINLESS STEEL |
| TYPE OF BACKFILL AROUND RISER | #30 SILICA SAND |
| THICKNESS AND TYPE OF SEAL | 3.0' BENTONITE PELLETS |
| DEPTH TO TOP OF FILTER SAND | 10.0' |
| TYPE OF FILTER AROUND SCREEN | #30 SILICA SAND |
| TYPE OF MONITORING WELL | STAINLESS STEEL |
| SCREEN GAUGE OR SIZE OF OPENINGS (slot no.) | .010 |
| DIAMETER AND LENGTH OF SCREEN | 2" x 10.0' |
| DEPTH TO BOTTOM OF MONITORING WELL | 24.8' |
| DEPTH TO BOTTOM OF FILTER SAND | 24.8' |
| DIAMETER OF BOREHOLE | 8" |

SUMMARY

L₁ - L₉

| | | |
|----------------|---|---------|
| L ₁ | = | NONE ft |
| L ₂ | = | 6.5 ft |
| L ₃ | = | 0.5 ft |
| L ₄ | = | 3.0 ft |
| L ₅ | = | 4.5 ft |
| L ₆ | = | 10.3 ft |
| L ₇ | = | NONE ft |
| L ₈ | = | 24.8 ft |
| L ₉ | = | 24.8 ft |

Installation Completed

Date 11-17-88 Time 15:55

SP-1988A

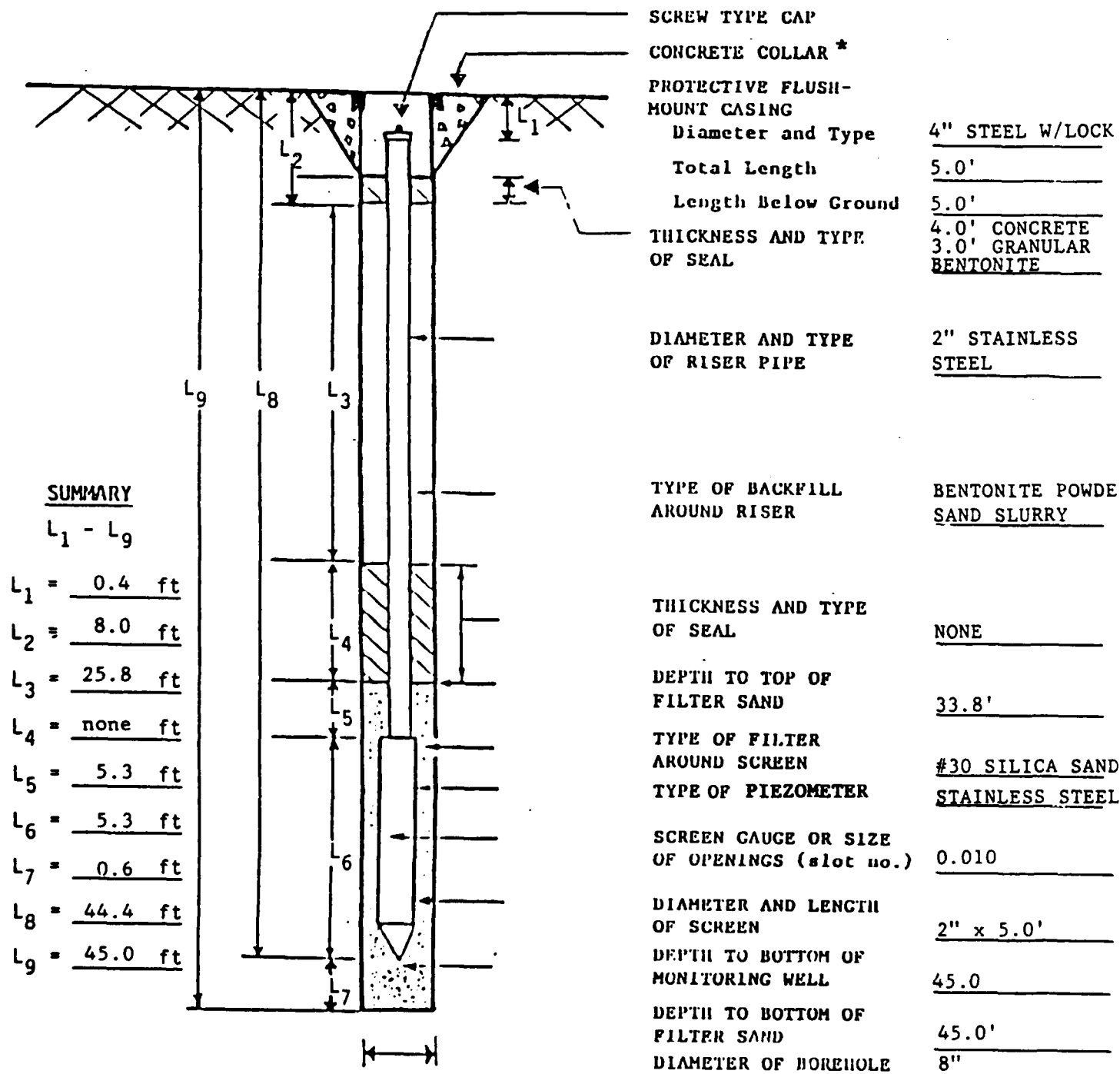
INSTALLATION OF FLUSH MOUNT PIEZOMETER

JOB NUMBER 8100-89-0181

PIEZOMETER NO. 112A

GROUND SURFACE ELEVATION 691.76

TOP OF RISER PIPE ELEVATION 691.22
(With Cap Removed)



* WELL INSTALLED IN MANHOLE

Installation Completed
Date 11-23-88 Time 12:00

SF-1988A

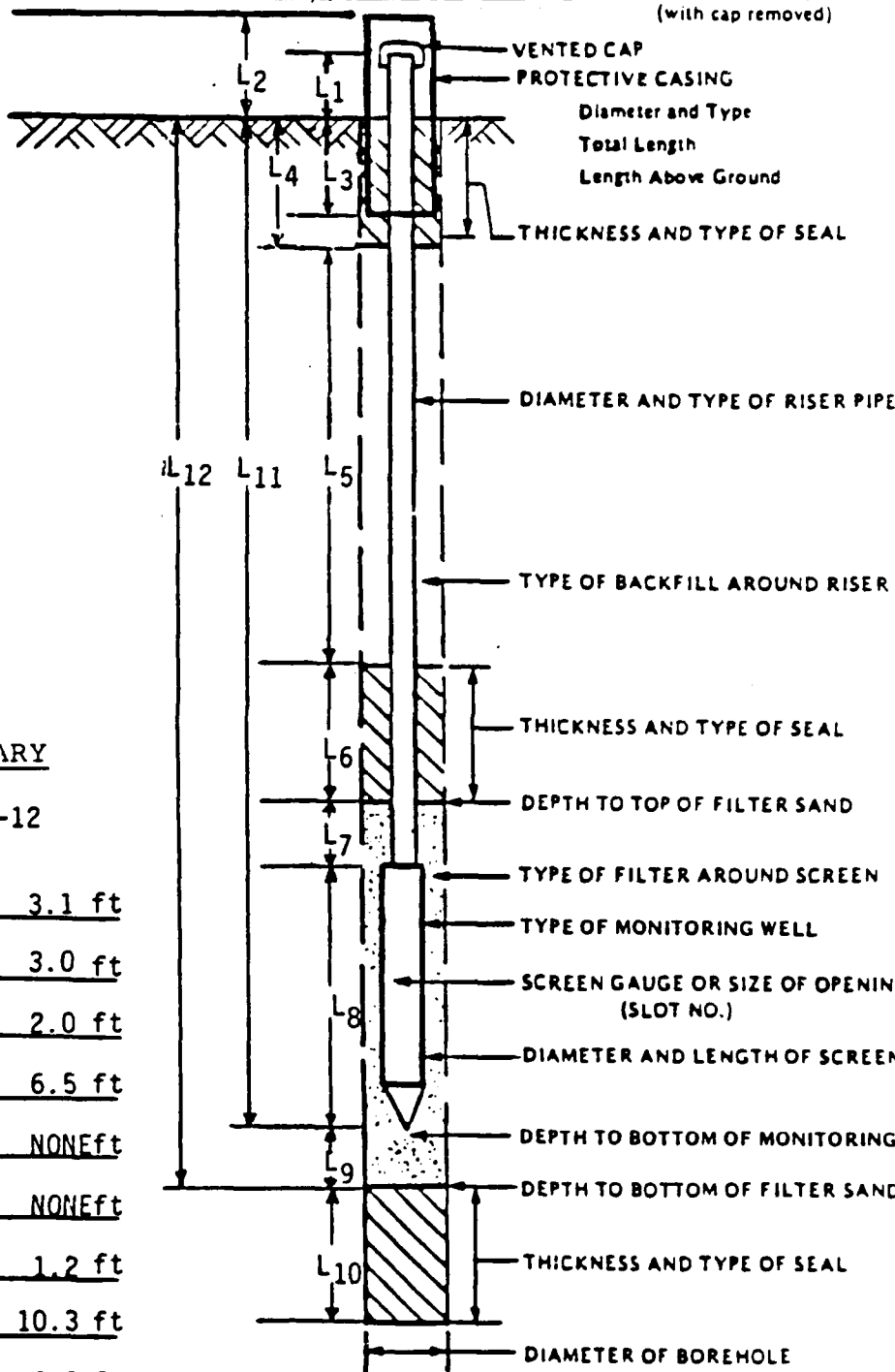
INSTALLATION OF MONITORING WELL

JOB NO. 8100-89-0181

MONITORING WELL NO. OW 113B

GROUND SURFACE ELEVATION 679.94

TOP OF RISER PIPE ELEVATION 682.94
(with cap removed)



4" STEEL W/LOCK

5.0'

3.0'

4.5' CONCRETE

2.0' BENTONITE
PELLETS

2" STAINLESS STEEL

NONE

NONE

6.5'

#3 SILICA SAND

STAINLESS STEEL

.010

2" x 10.0

18'

20'

NONE

8"

SUMMARY

L1 - L12

L1 = 3.1 ft

L2 = 3.0 ft

L3 = 2.0 ft

L4 = 6.5 ft

L5 = NONE ft

L6 = NONE ft

L7 = 1.2 ft

L8 = 10.3 ft

L9 = 2.0 ft

L10 = NONE ft

L11 = 18' ft

L12 = 20' ft

INSTALLATION COMPLETED:

Date 11-5-88 Time 10:00

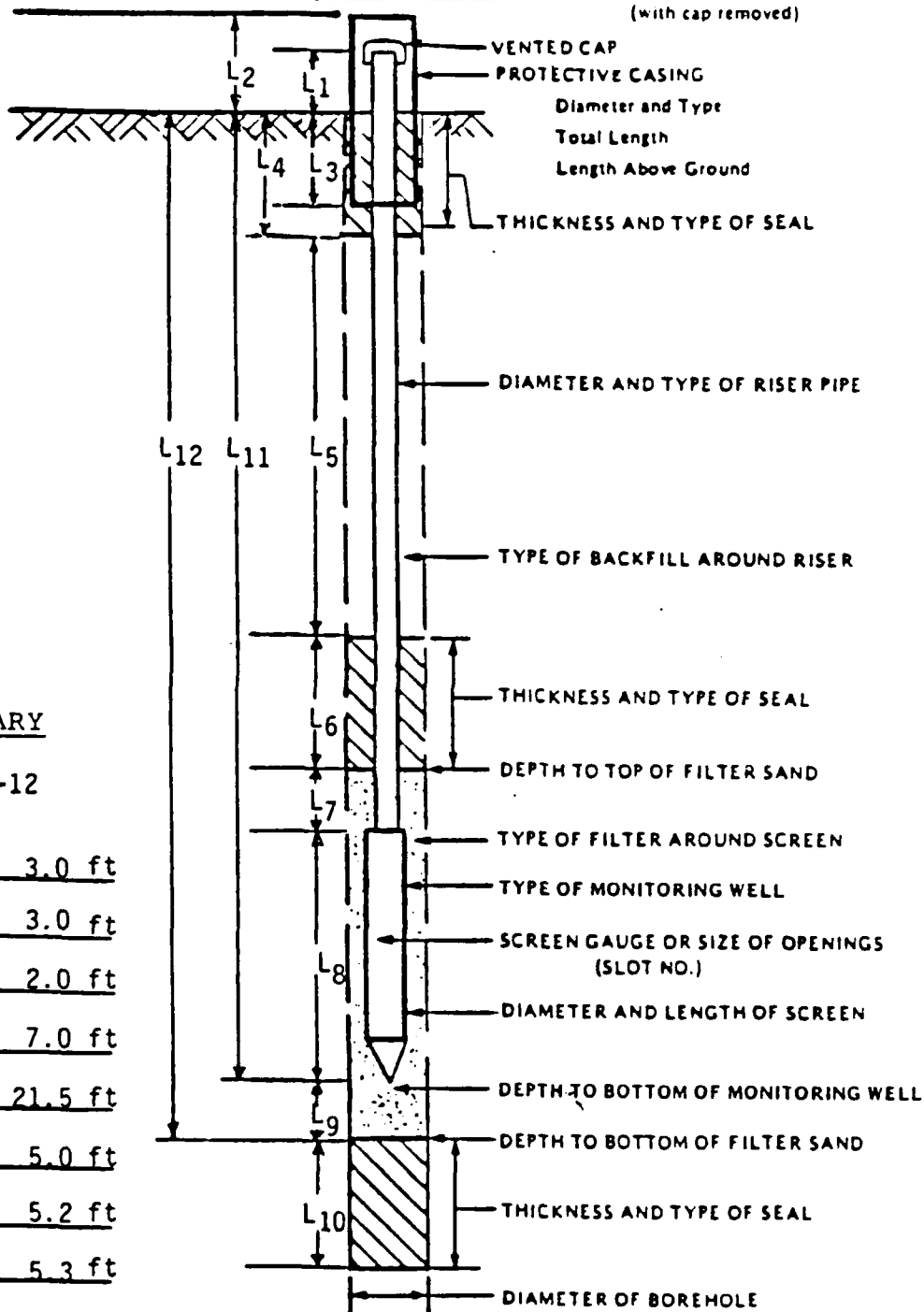
INSTALLATION OF PIEZOMETER

JOB NO. 8100-89-0181

PIEZOMETER NO. 113A

GROUND SURFACE ELEVATION 679.98

TOP OF RISER PIPE ELEVATION 682.98
(with cap removed)



4" STEEL W/LOCK
5.0'
3.0'
5.0' CONCRETE
2.0' BENTONITE
PELLETS

2" STAINLESS STEEL

BENTONITE POWDER
SAND SLURRY

5.0" BENTONITE
PELLETS

33.5'

#30 SILICA SAND

STAINLESS STEEL

.010

2" x 5.0'

44.0'

44.0'

NONE

8"

SUMMARY

L1 - L12

L1 = 3.0 ft

L2 = 3.0 ft

L3 = 2.0 ft

L4 = 7.0 ft

L5 = 21.5 ft

L6 = 5.0 ft

L7 = 5.2 ft

L8 = 5.3 ft

L9 = NONE ft

L10 = NONE ft

L11 = 44' ft

L12 = 44' ft

INSTALLATION COMPLETED:

Date 11-16-88 Time 11:51

APPENDIX E
WELL DEVELOPMENT FORMS

SAMPLING INFORMATION

Sampling Point Piezometer 113A Project U.S. Army Reserve Center
 Location Milwaukee, Wisconsin W.O.# 8100-89-0181

Sample ID # N/A Date Sampled ---/---/--- Time N/A AM/PM

Describe Sampling Point N/A

Well Depth 44 ft. below MP Casing Diameter 2 inches
 Depth to Water (below MP) 8.2 ft. Date 11 / 24 / 88 Time 09:30 AM/PM
 Discharge Rate = --- gpm x 0.00223 = --- cfs.
 At least --- bore volumes have been evacuated before sampling.

Sampling Method : ☐ Tap ☐ Submersible Pump ☒ Bailer ☐ Other ---

Pump intake or bailer set at --- ft. below MP.

Tubing (type: ---), (new or previously used) was used to collect all samples (yes, no) and all field measurements (yes, no). Tubing used only for ---

Sample Appearance: Turbid Odor: No

Note any Sampling Problems: Well bailed dry

Note any Cleaning performed in field: ---

Samples Collected: ---

EVACUATION/STABILIZATION TEST DATA

| Time | pH (Units) | Temperature Corrected Conductance (umhos/cm) | Temperature (°C) | Water Level (Nearest 0.01 ft) | Cumulative Volume of Water Removed From Well (gallons) | Pumping Rate (gpm) |
|-------|------------|--|------------------|-------------------------------|--|--------------------|
| 09:30 | 6.80 | 1300 | 13 | 8.20 | 35 | --- |
| 10:30 | 6.85 | 1200 | 13 | --- | 60 | --- |
| 12:50 | 6.80 | 1300 | 13 | --- | 75 | --- |
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Pumping start time 09:30

WL 8.20

Pumping stop time 12:50

WL Dry

Comments: ---

Form completed by: G Wellner

Reviewed by: R Levra



Twin City Testing

SAMPLING INFORMATION

Sampling Point OW 112B Project U.S. Army Reserve Center
Location Milwaukee, Wisconsin W.O.# 8100-89-0181

Sample ID # N/A Date Sampled -- / -- / -- Time N/A AM/PM
Describe Sampling Point N/A

Well Depth 24.8 ft. below MP Casing Diameter 2 inches
Depth to Water (below MP) 17.90 ft. Date 11 / 24 / 89 Time 13:01 XXX/PM
Discharge Rate = --- gpm x 0.00223 = --- cfs.
At least --- bore volumes have been evacuated before sampling.

Sampling Method : ☐ Tap ☐ Submersible Pump ☒ Bailer _____ ☐ Other _____
Pump intake or bailer set at _____ ft. below MP.
Tubing (type: _____), (new or previously used) was used to collect all samples (yes, no)
and all field measurements (yes, no). Tubing used only for _____

Sample Appearance: Clear Odor: None
 Note any Sampling Problems: None
 Note any Cleaning performed in field: None
 Samples Collected: ---

EVACUATION/STABILIZATION TEST DATA

[illegible]

Pumping start time 13:01 WL 17.9
Pumping stop time 14:30 WL 18.0

Comments: _____

Form completed by: G Wellner Reviewed by: R Levrø



SAMPLING INFORMATION

Sampling Point Piezometer 112A Project U.S. Army Reserve Center
 Location Milwaukee, Wisconsin W.O.# 8100-89-0181

Sample ID # N/A Date Sampled -- / -- / -- Time N/A AM/PM
 Describe Sampling Point N/A

Well Depth 44.4 ft. below MP Casing Diameter 2 inches
 Depth to Water (below MP) 17.7 ft. Date 11 / 24 / 88 Time 13:07 AM/PM
 Discharge Rate = --- gpm x 0.00223 = --- cfs.
 At least --- bore volumes have been evacuated before sampling.

Sampling Method : ☐ Tap ☐ Submersible Pump ☒ Bailer ☐ Other ---
 Pump intake or bailer set at --- ft. below MP.
 Tubing (type: ---), (new or previously used) was used to collect all samples (yes, no)
 and all field measurements (yes, no). Tubing used only for ---

Sample Appearance: Clear Odor: None
 Note any Sampling Problems: None
 Note any Cleaning performed in field: None
 Samples Collected: ---

EVACUATION/STABILIZATION TEST DATA

| Time | Dr (Units) | Temperature Corrected Conductance (umhos/cm) | Temperature (°C) | Water Level (Nearest 0.01 ft) | Cumulative Volume of Water Removed From Well (gallons) | Pumping Rate (gpm) |
|-------|---------------|---|---------------------|--|---|-----------------------|
| 13:07 | 6.20 | 1000 | 13 | 17.70 | 0 | --- |
| 14:00 | 6.30 | 860 | 11 | 17.70 | 100 | --- |
| 15:30 | 6.1 | 800 | 11 | 17.70 | 200 | --- |
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Pumping start time 13:07
 Pumping stop time 15:30

WL 17.70
 WL 17.70

Comments:

Form completed by: G Wellner Reviewed by: R Leyra



Eau Claire, Wisconsin
 City of Eau Claire

SAMPLING INFORMATION

Sampling Point OW-113B Project U.S. Army Reserve Center
 Location Milwaukee, Wisconsin W.O.# 8100-89-0181

Sample ID # N/A Date Sampled ---/---/--- Time N/A AM/PM
 Describe Sampling Point N/A

Well Depth 18.0 ft. below MP Casing Diameter 2 inches
 Depth to Water (below MP) 9.15 ft. Date 11 / 24 / 88 Time 09:30 AM/PM
 Discharge Rate = --- gpm x 0.00223 = --- cfs.
 At least --- bore volumes have been evacuated before sampling.

Sampling Method: ☐ Tap ☐ Submersible Pump ☒ Bailer ☐ Other ---
 Pump intake or bailer set at --- ft. below MP.
 Tubing (type: ---), (new or previously used) was used to collect all samples (yes, no) and all field measurements (yes, no). Tubing used only for ---

Sample Appearance: Clear Odor: None
 Note any Sampling Problems: None
 Note any Cleaning performed in field: None
 Samples Collected: N/A

EVACUATION/STABILIZATION TEST DATA

| Time | pH (Units) | Temperature Corrected Conductance (umhos/cm) | Temperature (°C) | Water Level (Nearest 0.01 ft) | Cumulative Volume of Water Removed From Well (gallons) | Pumping Rate (gpm) |
|-------|------------|--|------------------|-------------------------------|--|--------------------|
| 09:30 | 7.10 | 1200 | 12 | 9.15 | 0 | --- |
| 10:30 | 7.20 | 1300 | 11 | 9.15 | 40 | --- |
| 11:00 | 7.00 | 1200 | 11 | 9.15 | 75 | --- |
| 12:50 | 7.20 | 1100 | 11 | --- | 100 | --- |
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Pumping start time 09:30
 Pumping stop time 12:50

WL 9.15
 WL 9.15

Comments:

Form completed by: G Wellner

Reviewed by: R Levra



WISCONSIN DEPARTMENT OF NATURAL RESOURCES

APPENDIX F
GROUNDWATER SAMPLING RESULTS

US Army Reserve 84th Division
Groundwater Sampling and Analysis

Well Number GW-101B

| | Groundwater Standards, mg/l | | | Analytical Results, mg/l | | | | |
|-------------|--------------------------------|------|----|--------------------------|------|------|------|------|
| | Parameter | PAL | ES | 1/87 | 3/87 | 5/87 | 7/87 | 9/87 |
| Indicators: | | | | | | | | |
| | COD | 25 | - | 0.13 | 24 | 10 | 25 | 25 |
| | BOD | 25 | - | <6 | <6 | <6 | 6 | <6 |
| | Boron | 2 | - | 0.23 | 0.48 | 0.34 | 0.42 | 0.6 |
| | Cond @ 25° | 200 | - | 1410 | 1397 | 1291 | 1381 | 1231 |
| | pH | +/-1 | - | 6.48 | 6.97 | 6.73 | 6.87 | 7 |
| | Hardness | 100 | - | 660 | 710 | 670 | 740 | 760 |
| | Alkalinity | 100 | - | 520 | 540 | 560 | 540 | 520 |
| | NH3-N | 2 | - | 0.65 | 0.1 | 1 | 0.7 | 0.6 |

Public Health
and Welfare:

| | | | | | | | |
|-----------|--------|-------|---------|---------|---------|---------|---------|
| Chloride | 125 | 250 | 80 | 65 | 54 | 57 | 60 |
| Sulfates | 125 | 250 | 240 | 260 | 240 | 280 | 280 |
| Chromium | 0.005 | 0.05 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |
| Mercury | 0.0002 | 0.002 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 |
| Lead | 0.005 | 0.05 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |
| Cadmium | 0.001 | 0.01 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Arsenic | 0.005 | 0.05 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |
| Dis Iron | 0.15 | 0.3 | <0.1 | 0.16 | 0.11 | <0.1 | 0.86 |
| NO2+NO3-N | 2 | 10 | 0.06 | <0.05 | 0.1 | <0.05 | 0.12 |
| Barium | 0.2 | 1 | <1 | <1 | <1 | <1 | <1 |

Notes:

PAL - Denotes Preventive Action Limit (Increase above background)
ES - Denotes Enforcement Standard

US Army Reserve 84th Division
Groundwater Sampling and Analysis

Well Number OW-101B

| Volatile Organic Parameter | Groundwater Standards, ug/l | | Analytical Results, ug/l | | | |
|-------------------------------|--------------------------------|-------|--------------------------|------|-------|------|
| | PAL | ES | 2/87 | 7/87 | 12/88 | 1/89 |
| Methylene chloride | 15 | 150 | NA | NA | X | 2 |
| 1,1 - Dichloroethylene | 0.024 | 0.24 | X | NA | X | X |
| 1,1 - Dichloroethane | 85 | 850 | 0.5 | NA | 1 | 3 |
| Chloroform | - | - | X | NA | X | X |
| Carbon tetrachloride | - | - | X | NA | X | X |
| 1,2 - Dichloropropane | - | - | X | NA | X | X |
| Trichloroethylene (TCE) | 0.18 | 1.8 | X | NA | X | X |
| 1,1,2 - Trichloroethane | 0.06 | 0.6 | X | NA | X | X |
| Dibromochloromethane | - | - | X | NA | X | X |
| Tetrachloroethylene | 0.1 | 1 | X | NA | X | X |
| Chlorobenzene | - | - | X | NA | X | X |
| Trans-1,2-Dichloroethylene | 20 | 100 | NA | NA | X | X |
| 1,2 - Dichloroethane | 0.05 | 0.5 | X | NA | X | X |
| 1,1,1 - Trichloroethane | 40 | 200 | X | NA | X | X |
| Bromodichloromethane | - | - | X | NA | X | X |
| Benzene | 0.067 | 0.67 | X | NA | X | X |
| Bromoform | - | - | X | NA | X | X |
| 1,1,2,2-Tetrachloroethane | - | - | X | NA | X | X |
| Toluene | 68.6 | 343 | X | NA | X | X |
| Ethylbenzene | 272 | 1360 | X | NA | X | X |
| Vinyl chloride | 0.0015 | 0.015 | 12.5 | 18.6 | X | X |
| Total xylene | 124 | 620 | NA | NA | X | X |
| 1,2-Dichlorobenzene | 125 | 1250 | X | NA | X | X |
| 1,3-Dichlorobenzene | 125 | 1250 | X | NA | X | X |
| 1,4-Dichlorobenzene | 150 | 750 | X | NA | X | X |
| 2-Chloroethylvinyl Ether | - | - | X | NA | X | X |
| Cis-1,2-Dichloroethylene | 10 | 100 | NA | NA | 49 | 80 |
| trans-1,3-dichloropropene | - | - | X | NA | X | X |
| cis-1,3-dichloropropene | - | - | X | NA | X | X |
| Total 1,2-Dichloroethylene | - | - | 23.8 | 18.9 | NA | NA |
| Bromomethane | - | - | X | NA | NA | NA |
| Chloroethane | - | - | X | NA | NA | NA |
| Chloromethane | - | - | X | NA | NA | NA |
| Dichloromethane | - | - | X | NA | NA | NA |
| Trichlorofluoromethane | 698 | 3490 | X | NA | NA | NA |
| Dichlorodifluoromethane | - | - | X | NA | NA | NA |

X - Analyzed for but not detected

NA - Not analyzed

PAL - Denotes Preventive Action Limit

ES - Denotes Enforcement Standard

US Army Reserve 84th Division
Groundwater Sampling and Analysis

Well Number P-101A

| Parameter | Groundwater Standards, mg/l | | Analytical Results, mg/l | | | | |
|-------------|-----------------------------|----|--------------------------|------|------|------|------|
| | PAL | ES | 1/87 | 3/87 | 5/87 | 7/87 | 9/87 |
| Indicators: | | | | | | | |
| COD | 25 | - | 29 | 23 | 26 | 20 | 35 |
| BOD | 25 | - | <6 | <6 | <6 | <6 | <6 |
| Boron | 2 | - | 0.16 | 0.18 | 0.13 | 0.22 | 0.29 |
| Cond @ 25° | 200 | - | 1362 | 1334 | 1064 | 1258 | 1165 |
| pH | +/-1 | - | 6.67 | 6.9 | 7.3 | 6.64 | 6.87 |
| Hardness | 100 | - | 620 | 680 | 540 | 670 | 1300 |
| Alkalinity | 100 | - | 410 | 420 | 320 | 410 | 400 |
| NH3-N | 2 | - | 0.42 | 0.1 | 0.9 | 0.4 | 0.3 |

Public Health
and Welfare:

| | | | | | | | |
|-----------|--------|-------|---------|---------|---------|---------|---------|
| Chloride | 125 | 250 | 130 | 84 | 86 | 80 | 80 |
| Sulfates | 125 | 250 | 260 | 260 | 250 | 260 | 220 |
| Chromium | 0.005 | 0.05 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |
| Mercury | 0.0002 | 0.002 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 |
| Lead | 0.005 | 0.05 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |
| Cadmium | 0.001 | 0.01 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Arsenic | 0.005 | 0.05 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |
| Dis Iron | 0.15 | 0.3 | 3.4 | 3.4 | 0.22 | 0.67 | 3.4 |
| NO2+NO3-N | 2 | 10 | <0.05 | <0.05 | <0.05 | <0.05 | 0.08 |
| Barium | 0.2 | 1 | <1 | <1 | <1 | <1 | <1 |

Notes:

PAL - Denotes Preventive Action Limit (Increase above background)
ES - Denotes Enforcement Standard

US Army Reserve 84th Division
Groundwater Sampling and Analysis

Well Number P-101A

| Volatile Organic Parameter | Groundwater Standards, ug/l | | Analytical Results, ug/l | | | |
|-------------------------------|--------------------------------|-------|--------------------------|------|-------|------|
| | PAL | ES | 2/87 | 7/87 | 12/88 | 1/89 |
| Methylene chloride | 15 | 150 | NA | NA | X | 6 |
| 1,1 - Dichloroethylene | 0.024 | 0.24 | X | NA | X | X |
| 1,1 - Dichloroethane | 85 | 850 | X | NA | X | X |
| Chloroform | - | - | X | NA | X | X |
| Carbon tetrachloride | - | - | X | NA | X | X |
| 1,2 - Dichloropropane | - | - | X | NA | X | X |
| Trichloroethylene (TCE) | 0.18 | 1.8 | X | NA | X | X |
| 1,1,2 - Trichloroethane | 0.06 | 0.6 | X | NA | X | X |
| Dibromochloromethane | - | - | X | NA | X | X |
| Tetrachloroethylene | 0.1 | 1 | X | NA | X | X |
| Chlorobenzene | - | - | X | NA | X | X |
| Trans-1,2-Dichloroethylene | 20 | 100 | NA | NA | X | X |
| 1,2 - Dichloroethane | 0.05 | 0.5 | X | NA | X | 2 |
| 1,1,1 - Trichloroethane | 40 | 200 | X | NA | X | X |
| Bromodichloromethane | - | - | X | NA | X | X |
| Benzene | 0.067 | 0.67 | X | NA | X | X |
| Bromoform | - | - | X | NA | X | X |
| 1,1,1,2-Tetrachloroethane | - | - | X | NA | X | X |
| Toluene | 68.6 | 343 | X | NA | X | X |
| Ethylbenzene | 272 | 1360 | X | NA | X | X |
| Vinyl chloride | 0.0015 | 0.015 | 336 | 304 | X | X |
| Total xylene | 124 | 620 | NA | NA | X | X |
| 1,2-Dichlorobenzene | 125 | 1250 | X | NA | X | X |
| 1,3-Dichlorobenzene | 125 | 1250 | X | NA | X | X |
| 1,4-Dichlorobenzene | 150 | 750 | X | NA | X | 3 |
| 2-Chloroethylvinyl Ether | - | - | X | NA | X | X |
| Cis-1,2-Dichloroethylene | 10 | 100 | NA | NA | X | X |
| trans-1,3-dichloropropene | - | - | X | NA | X | X |
| cis-1,3-dichloropropene | - | - | X | NA | X | X |
| Total 1,2-Dichloroethylene | - | - | X | NA | NA | NA |
| Bromoethane | - | - | X | NA | NA | NA |
| Chloroethane | - | - | X | NA | NA | NA |
| Chloromethane | - | - | X | NA | NA | NA |
| Dichloromethane | - | - | X | NA | NA | NA |
| Trichlorofluoromethane | 698 | 3490 | X | NA | NA | NA |
| Dichlorodifluoromethane | - | - | X | NA | NA | NA |

X - Analyzed for but not detected

NA - Not analyzed

PAL - Denotes Preventive Action Limit

ES - Denotes Enforcement Standard

US Army Reserve 84th Division
Groundwater Sampling and Analysis

Well Number DW-102B

| Parameter | Groundwater Standards, mg/l | | Analytical Results, mg/l | | | | |
|----------------------------|-----------------------------|-------|--------------------------|---------|---------|---------|---------|
| | PAL | ES | 1/87 | 3/87 | 5/87 | 7/87 | 9/87 |
| Indicators: | | | | | | | |
| COD | 25 | - | 0.28 | 34 | 14 | 53 | 20 |
| BOD | 25 | - | 7 | <6 | <6 | <6 | <6 |
| Boron | 2 | - | 0.16 | 0.44 | 0.3 | 0.31 | 0.45 |
| Cond @ 25° | 200 | - | 1305 | 1256 | 1045 | 1180 | 1045 |
| pH | +/-1 | - | 6.79 | 6.75 | 6.99 | 6.77 | 6.93 |
| Hardness | 100 | - | 540 | 370 | 690 | 630 | 900 |
| Alkalinity | 100 | - | 470 | 500 | 510 | 480 | 440 |
| NH3-N | 2 | - | 1 | 0.1 | 0.9 | 1.4 | 1.2 |
| Public Health and Welfare: | | | | | | | |
| Chloride | 125 | 250 | 54 | 24 | 31 | 63 | 45 |
| Sulfates | 125 | 250 | 210 | 240 | 270 | 180 | 180 |
| Chromium | 0.005 | 0.05 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |
| Mercury | 0.0002 | 0.002 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 |
| Lead | 0.005 | 0.05 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |
| Cadmium | 0.001 | 0.01 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Arsenic | 0.005 | 0.05 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |
| Dis Iron | 0.15 | 0.3 | <0.1 | <0.1 | 0.11 | <0.1 | 2.3 |
| NO2+NO3-N | 2 | 10 | <0.05 | 0.08 | <0.05 | <0.05 | 0.12 |
| Barium | 0.2 | 1 | <1 | <1 | <1 | <1 | <1 |

Notes:

PAL - Denotes Preventive Action Limit (Increase above background)
ES - Denotes Enforcement Standard

US Army Reserve 64th Division
Groundwater Sampling and Analysis

Well Number GW-102B

| Volatile Organic Parameter | Groundwater Standards, ug/l | | Analytical Results, ug/l | | | |
|-------------------------------|--------------------------------|-------|--------------------------|------|-------|------|
| | PAL | ES | 2/87 | 7/88 | 12/88 | 1/89 |
| Methylene chloride | 15 | 150 | NA | NA | X | 3 |
| 1,1 - Dichloroethylene | 0.024 | 0.24 | X | NA | X | X |
| 1,1 - Dichloroethane | 85 | 850 | 1.2 | NA | 1 | 3 |
| Chloroform | - | - | X | NA | X | X |
| Carbon tetrachloride | - | - | X | NA | X | X |
| 1,2 - Dichloropropane | - | - | X | NA | X | X |
| Trichloroethylene (TCE) | 0.18 | 1.8 | 1 | NA | 0.6 | X |
| 1,1,2 - Trichloroethane | 0.06 | 0.6 | X | NA | X | X |
| Dibromochloromethane | - | - | X | NA | X | X |
| Tetrachloroethylene | 0.1 | 1 | X | NA | X | X |
| Chlorobenzene | - | - | X | NA | X | X |
| Trans-1,2-Dichloroethylene | 20 | 100 | NA | NA | X | X |
| 1,2 - Dichloroethane | 0.05 | 0.5 | X | NA | X | X |
| 1,1,1 - Trichloroethane | 40 | 200 | X | NA | X | X |
| Bromodichloromethane | - | - | X | NA | X | X |
| Benzene | 0.067 | 0.67 | X | NA | 1 | X |
| Bromoform | - | - | X | NA | X | X |
| 1,1,2,2-Tetrachloroethane | - | - | X | NA | X | X |
| Toluene | 68.6 | 343 | X | NA | X | X |
| Ethylbenzene | 272 | 1360 | X | NA | X | X |
| Vinyl chloride | 0.0015 | 0.015 | 23.1 | 42.5 | X | X |
| Total xylene | 124 | 620 | NA | NA | 2 | X |
| 1,2-Dichlorobenzene | 125 | 1250 | X | NA | X | X |
| 1,3-Dichlorobenzene | 125 | 1250 | X | NA | X | X |
| 1,4-Dichlorobenzene | 150 | 750 | X | NA | X | X |
| 2-Chloroethylvinyl Ether | - | - | X | NA | X | X |
| Cis-1,2-Dichloroethylene | 10 | 100 | NA | NA | 11 | 16 |
| trans-1,3-dichloropropene | - | - | X | NA | X | X |
| cis-1,3-dichloropropene | - | - | X | NA | X | X |
| Total 1,2-Dichloroethylene | - | - | 13.9 | 14.6 | NA | NA |
| Bromomethane | - | - | X | NA | NA | NA |
| Chloroethane | - | - | X | NA | NA | NA |
| Chloromethane | - | - | X | NA | NA | NA |
| Dichloromethane | - | - | 0.3 | NA | NA | NA |
| Trichlorofluoromethane | 698 | 3490 | X | NA | NA | NA |
| Dichlorodifluoromethane | - | - | X | NA | NA | NA |

X - Analyzed for but not detected

NA - Not analyzed

PAL - Denotes Preventive Action Limit

ES - Denotes Enforcement Standard

US Army Reserve 84th Division
Groundwater Sampling and Analysis

Well Number P-102A

| Parameter | Groundwater Standards, mg/l | | Analytical Results, mg/l | | | | |
|----------------------------|-----------------------------|-------|--------------------------|---------|---------|---------|---------|
| | PAL | ES | 1/87 | 3/87 | 5/87 | 7/87 | 9/87 |
| Indicators: | | | | | | | |
| COD | 25 | - | 49 | <5 | 14 | 20 | 25 |
| BOD | 25 | - | <6 | 7 | <6 | 7 | <6 |
| Boron | 2 | - | 0.23 | 0.33 | 0.25 | 0.34 | 0.42 |
| Cond @ 25° | 200 | - | 1156 | 1175 | 814 | 1105 | 993 |
| pH | +/-1 | - | 7 | 7.11 | 7.22 | 7.06 | 7.1 |
| Hardness | 100 | - | 460 | 600 | 550 | 590 | 600 |
| Alkalinity | 100 | - | 340 | 430 | 440 | 460 | 420 |
| NH3-N | 2 | - | 0.57 | 0.1 | 0.7 | 1.1 | 1.2 |
| Public Health and Welfare: | | | | | | | |
| Chloride | 125 | 250 | 75 | 38 | 42 | 47 | 200 |
| Sulfates | 125 | 250 | 230 | 220 | 200 | 160 | 200 |
| Chromium | 0.005 | 0.05 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |
| Mercury | 0.0002 | 0.002 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 |
| Lead | 0.005 | 0.05 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |
| Cadmium | 0.001 | 0.01 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Arsenic | 0.005 | 0.05 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |
| Dis Iron | 0.15 | 0.3 | <0.1 | <0.1 | 0.22 | 0.51 | 1.1 |
| NO2+NO3-N | 2 | 10 | 0.19 | 0.25 | 0.11 | <0.05 | 0.17 |
| Barium | 0.2 | 1 | <1 | <1 | <1 | <1 | <1 |

Notes:

PAL - Denotes Preventive Action Limit (Increase above background)
ES - Denotes Enforcement Standard

US Army Reserve 84th Division
Groundwater Sampling and Analysis

Well Number P-102A

| Volatile Organic Parameter | Groundwater Standards, ug/l | | Analytical Results, ug/l | | | |
|-------------------------------|--------------------------------|-------|--------------------------|------|-------|------|
| | PAL | ES | 2/87 | 7/87 | 12/88 | 1/89 |
| Methylene chloride | 15 | 150 | NA | NA | X | 10 |
| 1,1 - Dichloroethylene | 0.024 | 0.24 | X | NA | X | X |
| 1,1 - Dichloroethane | 85 | 850 | 0.7 | NA | 2 | 7 |
| Chloroform | - | - | X | NA | X | X |
| Carbon tetrachloride | - | - | X | NA | X | X |
| 1,2 - Dichloropropane | - | - | X | NA | X | X |
| Trichloroethylene (TCE) | 0.18 | 1.8 | X | NA | X | 8 |
| 1,1,2 - Trichloroethane | 0.06 | 0.6 | X | NA | X | 5 |
| Dibromochloromethane | - | - | X | NA | 3 | 2 |
| Tetrachloroethylene | 0.1 | 1 | X | NA | X | X |
| Chlorobenzene | - | - | X | NA | X | 3 |
| Trans-1,2-Dichloroethylene | 20 | 100 | NA | NA | X | X |
| 1,2 - Dichloroethane | 0.05 | 0.5 | X | NA | X | 5 |
| 1,1,1 - Trichloroethane | 40 | 200 | X | NA | X | X |
| Bromodichloromethane | - | - | X | NA | X | 5 |
| Benzene | 0.067 | 0.67 | X | NA | X | X |
| Bromoform | - | - | X | NA | 5 | X |
| 1,1,2,2-Tetrachloroethane | - | - | X | NA | X | X |
| Toluene | 68.6 | 343 | X | NA | X | X |
| Ethylbenzene | 272 | 1360 | X | NA | X | X |
| Vinyl chloride | 0.0015 | 0.015 | 3 | 29.4 | X | X |
| Total xylene | 124 | 620 | NA | NA | 5 | 5 |
| 1,2-Dichlorobenzene | 125 | 1250 | X | NA | 10 | 18 |
| 1,3-Dichlorobenzene | 125 | 1250 | X | NA | 15 | 14 |
| 1,4-Dichlorobenzene | 150 | 750 | X | NA | 8 | 14 |
| 2-Chloroethylvinyl Ether | - | - | X | NA | X | X |
| Cis-1,2-Dichloroethylene | 10 | 100 | NA | NA | 8 | 30 |
| trans-1,3-dichloropropene | - | - | X | NA | 1 | X |
| cis-1,3-dichloropropene | - | - | X | NA | 3 | X |
| Total 1,2-Dichloroethylene | - | - | 4 | 8.6 | NA | NA |
| Bromoethane | - | - | X | NA | NA | NA |
| Chloroethane | - | - | X | NA | NA | NA |
| Chloromethane | - | - | X | NA | NA | NA |
| Dichloromethane | - | - | X | NA | NA | NA |
| Trichlorofluoromethane | 698 | 3490 | X | NA | NA | NA |
| Dichlorodifluoromethane | - | - | X | NA | NA | NA |

X - Analyzed for but not detected

NA - Not analyzed

PAL - Denotes Preventive Action Limit

ES - Denotes Enforcement Standard

US Army Reserve 84th Division
Groundwater Sampling and Analysis

Well Number OW-105B

| Volatile Organic Parameter | Groundwater Standards, ug/l | | Analytical Results, ug/l | |
|-------------------------------|--------------------------------|-------|-----------------------------|------|
| | PAL | ES | 12/88 | 1/89 |
| Methylene chloride | 15 | 150 | X | 7 |
| 1,1 - Dichloroethylene | 0.024 | 0.24 | X | X |
| 1,1 - Dichloroethane | 85 | 850 | X | 4.8 |
| Chloroform | - | - | X | X |
| Carbon tetrachloride | - | - | X | 3 |
| 1,2 - Dichloropropane | - | - | X | X |
| Trichloroethylene (TCE) | 0.18 | 1.8 | X | 3.1 |
| 1,1,2 - Trichloroethane | 0.06 | 0.6 | X | 3 |
| Dibromochloromethane | - | - | X | X |
| Tetrachloroethylene | 0.1 | 1 | X | 2 |
| Chlorobenzene | - | - | X | 2 |
| Trans-1,2-Dichloroethylene | 20 | 100 | X | 2.4 |
| 1,2 - Dichloroethane | 0.05 | 0.5 | X | 6 |
| 1,1,1 - Trichloroethane | 40 | 200 | X | 6 |
| Bromodichloromethane | - | - | X | 2 |
| Benzene | 0.067 | 0.67 | X | X |
| Bromoform | - | - | X | X |
| 1,1,2,2-Tetrachloroethane | - | - | X | X |
| Toluene | 68.6 | 343 | X | X |
| Ethylbenzene | 272 | 1360 | X | X |
| Vinyl chloride | 0.0015 | 0.015 | X | X |
| Total xylene | 124 | 620 | X | 3 |
| 1,2-Dichlorobenzene | 125 | 1250 | X | 6 |
| 1,3-Dichlorobenzene | 125 | 1250 | X | 5 |
| 1,4-Dichlorobenzene | 150 | 750 | X | 3 |
| 2-Chloroethylvinyl Ether | - | - | X | X |
| Cis-1,2-Dichloroethylene | 10 | 100 | X | 6.6 |
| trans-1,3-dichloropropene | - | - | X | X |
| cis-1,3-dichloropropene | - | - | X | X |
| Total 1,2-Dichloroethylene | - | - | NA | NA |
| Bromomethane | - | - | NA | NA |
| Chloroethane | - | - | NA | NA |
| Chloromethane | - | - | NA | NA |
| Dichloromethane | - | - | NA | NA |
| Trichlorofluoromethane | 698 | 3490 | NA | NA |
| Dichlorodifluoromethane | - | - | NA | NA |

X - Analyzed for but not detected

NA - Not analyzed

PAL - Denotes Preventive Action Limit

ES - Denotes Enforcement Standard

US Army Reserve 84th Division
Groundwater Sampling and Analysis

Well Number P-105A

| | | Groundwater Standards, mg/l | | Analytical Results, mg/l | | | | |
|----------------------------|--|-----------------------------|-------|--------------------------|---------|---------|---------|---------|
| Parameter | | PAL | ES | 1/87 | 3/87 | 5/87 | 7/87 | 9/87 |
| Indicators: | | | | | | | | |
| COD | | 25 | - | 18 | 16 | 18 | <5 | 10 |
| BOD | | 25 | - | <6 | <6 | <6 | <6 | <6 |
| Boron | | 2 | - | 0.36 | 0.25 | 0.15 | 0.23 | 0.27 |
| Cond @ 25° | | 200 | - | 1536 | 1463 | 860 | 1100 | 1203 |
| pH | | +/-1 | - | 6.75 | 7.1 | 7.09 | 6.95 | 6.95 |
| Hardness | | 100 | - | 730 | 760 | 720 | 720 | 820 |
| Alkalinity | | 100 | - | 420 | 430 | 430 | 410 | 420 |
| NH3-N | | 2 | - | 0.27 | 0.3 | 0.2 | 0.5 | 0.2 |
| Public Health and Welfare: | | | | | | | | |
| Chloride | | 125 | 250 | 150 | 100 | 100 | 100 | 75 |
| Sulfates | | 125 | 250 | 300 | 300 | 310 | 290 | 320 |
| Chromium | | 0.005 | 0.05 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |
| Mercury | | 0.0002 | 0.002 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 |
| Lead | | 0.005 | 0.05 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |
| Cadmium | | 0.001 | 0.01 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Arsenic | | 0.005 | 0.05 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |
| Dis Iron | | 0.15 | 0.3 | 2.9 | 2.8 | 1.7 | <0.1 | 2.1 |
| NO2+NO3-N | | 2 | 10 | <0.05 | <0.05 | <0.05 | <0.05 | 0.06 |
| Barium | | 0.2 | 1 | <1 | <1 | <1 | <1 | <1 |

Notes:

PAL - Denotes Preventive Action Limit (Increase above background)
ES - Denotes Enforcement Standard

US Army Reserve 84th Division
Groundwater Sampling and Analysis

Well Number P-105A

| Volatile Organic Parameter | Groundwater Standards, ug/l | | Analytical Results, ug/l | | | |
|-------------------------------|--------------------------------|-------|--------------------------|------|-------|------|
| | PAL | ES | 2/87 | 7/87 | 12/88 | 1/89 |
| Methylene chloride | 15 | 150 | NA | NA | X | 2 |
| 1,1 - Dichloroethylene | 0.024 | 0.24 | X | NA | X | X |
| 1,1 - Dichloroethane | 85 | 850 | X | NA | X | X |
| Chloroform | - | - | X | NA | X | X |
| Carbon tetrachloride | - | - | X | NA | X | X |
| 1,2 - Dichloropropane | - | - | X | NA | X | X |
| Trichloroethylene (TCE) | 0.18 | 1.8 | X | NA | X | 1.2 |
| 1,1,2 - Trichloroethane | 0.06 | 0.6 | X | NA | X | X |
| Dibromochloromethane | - | - | X | NA | X | X |
| Tetrachloroethylene | 0.1 | 1 | X | NA | X | X |
| Chlorobenzene | - | - | X | NA | X | X |
| Trans-1,2-Dichloroethylene | 20 | 100 | NA | NA | X | 0.5 |
| 1,2 - Dichloroethane | 0.05 | 0.5 | X | NA | X | 4 |
| 1,1,1 - Trichloroethane | 40 | 200 | X | NA | X | X |
| Bromodichloromethane | - | - | X | NA | X | X |
| Benzene | 0.067 | 0.67 | X | NA | X | X |
| Bromoform | - | - | X | NA | X | X |
| 1,1,2,2-Tetrachloroethane | - | - | X | NA | X | X |
| Toluene | 68.6 | 343 | X | NA | X | X |
| Ethylbenzene | 272 | 1360 | X | NA | X | X |
| Vinyl chloride | 0.0015 | 0.015 | 39.9 | 19.1 | X | X |
| Total xylene | 124 | 620 | NA | NA | X | X |
| 1,2-Dichlorobenzene | 125 | 1250 | X | NA | X | 6 |
| 1,3-Dichlorobenzene | 125 | 1250 | X | NA | X | X |
| 1,4-Dichlorobenzene | 150 | 750 | X | NA | X | 4 |
| 2-Chloroethylvinyl Ether | - | - | X | NA | X | X |
| Cis-1,2-Dichloroethylene | 10 | 100 | NA | NA | 2 | 20 |
| trans-1,3-dichloropropene | - | - | X | NA | X | X |
| cis-1,3-dichloropropene | - | - | X | NA | NA | NA |
| Total 1,2-Dichloroethylene | - | - | X | NA | NA | NA |
| Bromomethane | - | - | X | NA | NA | NA |
| Chloroethane | - | - | X | NA | NA | NA |
| Chloromethane | - | - | X | NA | NA | NA |
| Dichloromethane | - | - | X | NA | NA | NA |
| Trichlorofluoromethane | 698 | 3490 | X | NA | NA | NA |
| Dichlorodifluoromethane | - | - | X | NA | NA | NA |

X - Analyzed for but not detected

NA - Not analyzed

PAL - Denotes Preventive Action Limit

ES - Denotes Enforcement Standard

US Army Reserve 84th Division
Groundwater Sampling and Analysis

Well Number OW-106B

| | Groundwater Standards, mg/l | | Analytical Results, mg/l | | | | |
|-------------------------------|--------------------------------|-------|--------------------------|---------|---------|---------|---------|
| | PAL | ES | 1/87 | 3/87 | 5/87 | 7/87 | 9/87 |
| Indicators: | | | | | | | |
| COD | 25 | - | 0.21 | <5 | 6 | <5 | 15 |
| BOD | 25 | - | <6 | <6 | <6 | <6 | <6 |
| Boron | 2 | - | 0.49 | | 0.08 | 0.05 | 0.19 |
| Cond @ 25° | 200 | - | 982 | 932 | 1417 | 805 | 856 |
| pH | +/-1 | - | 6.8 | 7.06 | 7.5 | 7.05 | 6.87 |
| Hardness | 100 | - | 480 | 560 | 490 | 550 | 570 |
| Alkalinity | 100 | - | 380 | 390 | 380 | 400 | 390 |
| NH3-N | 2 | - | 0.15 | <0.1 | <0.1 | <0.1 | 0.1 |
| Public Health and Welfare: | | | | | | | |
| Chloride | 125 | 250 | 150 | 20 | 21 | 18 | 15 |
| Sulfates | 125 | 250 | 300 | 180 | 160 | 130 | 170 |
| Chromium | 0.005 | 0.05 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |
| Mercury | 0.0002 | 0.002 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 |
| Lead | 0.005 | 0.05 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |
| Cadmium | 0.001 | 0.01 | <0.001 | <0.001 | <0.001 | <0.001 | 0.0029 |
| Arsenic | 0.005 | 0.05 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |
| Dis Iron | 0.15 | 0.3 | <0.1 | <0.1 | 0.2 | <0.1 | <0.1 |
| NO2+NO3-N | 2 | 10 | <0.05 | <0.05 | <0.05 | <0.05 | 0.08 |
| Barium | 0.2 | 1 | <1 | <1 | <1 | <1 | <1 |

Notes:

PAL - Denotes Preventive Action Limit (Increase above background)
ES - Denotes Enforcement Standard

US Army Reserve 84th Division
Groundwater Sampling and Analysis

Well Number OW-106B

| Volatile Organic Parameter | Groundwater Standards, ug/l | | Analytical Results, ug/l | | |
|-------------------------------|--------------------------------|-------|--------------------------|-------|------|
| | PAL | ES | 2/87 | 12/88 | 1/89 |
| Methylene chloride | 15 | 150 | NA | X | 5 |
| 1,1 - Dichloroethylene | 0.024 | 0.24 | X | X | X |
| 1,1 - Dichloroethane | 85 | 850 | X | X | 0.9 |
| Chloroform | - | - | X | X | 3 |
| Carbon tetrachloride | - | - | X | X | X |
| 1,2 - Dichloropropane | - | - | X | X | X |
| Trichloroethylene (TCE) | 0.18 | 1.8 | X | X | 0.7 |
| 1,1,2 - Trichloroethane | 0.06 | 0.6 | X | X | 3 |
| Dibromochloromethane | - | - | X | X | X |
| Tetrachloroethylene | 0.1 | 1 | X | X | X |
| Chlorobenzene | - | - | X | X | X |
| Trans-1,2-Dichloroethylene | 20 | 100 | NA | X | X |
| 1,2 - Dichloroethane | 0.05 | 0.5 | X | X | 2 |
| 1,1,1 - Trichloroethane | 40 | 200 | X | X | X |
| Bromodichloromethane | - | - | X | X | 2 |
| Benzene | 0.067 | 0.67 | X | X | X |
| Bromoform | - | - | X | X | X |
| 1,1,2,2-Tetrachloroethane | - | - | X | X | X |
| Toluene | 68.6 | 343 | X | X | X |
| Ethylbenzene | 272 | 1360 | X | X | X |
| Vinyl chloride | 0.0015 | 0.015 | X | X | X |
| Total xylene | 124 | 620 | NA | X | X |
| 1,2-Dichlorobenzene | 125 | 1250 | X | X | 10 |
| 1,3-Dichlorobenzene | 125 | 1250 | X | X | 8 |
| 1,4-Dichlorobenzene | 150 | 750 | X | X | 8 |
| 2-Chloroethylvinyl Ether | - | - | X | X | X |
| Cis-1,2-Dichloroethylene | 10 | 100 | NA | X | 4 |
| trans-1,3-dichloropropene | - | - | X | X | X |
| cis-1,3-dichloropropene | - | - | X | X | X |
| Total 1,2-Dichloroethylene | - | - | X | NA | NA |
| Bromomethane | - | - | X | NA | NA |
| Chloroethane | - | - | X | NA | NA |
| Chloromethane | - | - | X | NA | NA |
| Dichloromethane | - | - | X | NA | NA |
| Trichlorofluoromethane | 698 | 3490 | X | NA | NA |
| Dichlorodifluoromethane | - | - | X | NA | NA |

X - Analyzed for but not detected

NA - Not analyzed

PAL - Denotes Preventive Action Limit

ES - Denotes Enforcement Standard

US Army Reserve 84th Division
Groundwater Sampling and Analysis

Well Number P-106A

| Volatile Organic Parameter | Groundwater Standards, ug/l | | Analytical Results, ug/l | |
|-------------------------------|--------------------------------|-------|-----------------------------|------|
| | PAL | ES | 12/88 | 1/89 |
| Methylene chloride | 15 | 150 | X | 9 |
| 1,1 - Dichloroethylene | 0.024 | 0.24 | X | X |
| 1,1 - Dichloroethane | 85 | 850 | X | 2 |
| Chloroform | - | - | X | 5 |
| Carbon tetrachloride | - | - | X | X |
| 1,2 - Dichloropropane | - | - | X | X |
| Trichloroethylene (TCE) | 0.18 | 1.8 | X | X |
| 1,1,2 - Trichloroethane | 0.06 | 0.6 | X | 6 |
| Dibromochloromethane | - | - | X | 3 |
| Tetrachloroethylene | 0.1 | 1 | X | X |
| Chlorobenzene | - | - | X | 2 |
| Trans-1,2-Dichloroethylene | 20 | 100 | X | X |
| 1,2 - Dichloroethane | 0.05 | 0.5 | X | 5 |
| 1,1,1 - Trichloroethane | 40 | 200 | X | X |
| Bromodichloromethane | - | - | X | 4 |
| Benzene | 0.067 | 0.67 | X | X |
| Bromoform | - | - | X | 2 |
| 1,1,2,2-Tetrachloroethane | - | - | X | X |
| Toluene | 68.6 | 343 | X | X |
| Ethylbenzene | 272 | 1360 | X | X |
| Vinyl chloride | 0.0015 | 0.015 | X | X |
| Total xylene | 124 | 620 | X | 4 |
| 1,2-Dichlorobenzene | 125 | 1250 | X | 17 |
| 1,3-Dichlorobenzene | 125 | 1250 | X | 12 |
| 1,4-Dichlorobenzene | 150 | 750 | X | 12 |
| 2-Chloroethylvinyl Ether | - | - | X | X |
| Cis-1,2-Dichloroethylene | 10 | 100 | 3 | 10 |
| trans-1,3-dichloropropene | - | - | X | X |
| cis-1,3-dichloropropene | - | - | X | X |
| Total 1,2-Dichloroethylene | - | - | NA | NA |
| Bromomethane | - | - | NA | NA |
| Chloroethane | - | - | NA | NA |
| Chloromethane | - | - | NA | NA |
| Dichloromethane | - | - | NA | NA |
| Trichlorofluoromethane | 698 | 3490 | NA | NA |
| Dichlorodifluoromethane | - | - | NA | NA |

X - Analyzed for but not detected

NA - Not analyzed

PAL - Denotes Preventive Action Limit

ES - Denotes Enforcement Standard

US Army Reserve 84th Division
Groundwater Sampling and Analysis

Well Number OW-112B

| Parameter | Groundwater Standards, mg/l | | Analytical Results, mg/l | |
|-------------|-----------------------------|----|--------------------------|------|
| | PAL | ES | 12/88 | 1/89 |
| Indicators: | | | | |
| COD | 25 | - | <5 | <5 |
| BOD | 25 | - | <3 | <2 |
| Boron | 2 | - | <0.05 | 0.16 |
| Cond @ 25° | 200 | - | 1642 | 1133 |
| pH | +/-1 | - | 7.95 | 8.12 |
| Hardness | 100 | - | 775 | 600 |
| Alkalinity | 100 | - | 524 | 376 |
| NH3-N | 2 | - | <0.1 | <0.1 |

Public Health
and Welfare:

| | | | | |
|-----------|--------|-------|---------|---------|
| Chloride | 125 | 250 | 226 | 23.5 |
| Sulfates | 125 | 250 | 201 | 226 |
| Chromium | 0.005 | 0.05 | <0.002 | <0.002 |
| Mercury | 0.0002 | 0.002 | <0.0002 | <0.0002 |
| Lead | 0.005 | 0.05 | 0.04 | <0.002 |
| Cadmium | 0.001 | 0.01 | <0.001 | <0.001 |
| Arsenic | 0.005 | 0.05 | <0.001 | 0.002 |
| Dis Iron | 0.15 | 0.3 | 1.87 | 0.87 |
| NO2+NO3-N | 2 | 10 | <0.05 | <0.05 |
| Barium | 0.2 | 1 | 0.24 | 0.18 |

Notes:

PAL - Denotes Preventive Action Limit (Increase above background)
ES - Denotes Enforcement Standard

US Army Reserve 84th Division
Groundwater Sampling and Analysis

Well Number OW-112B

| Volatile Organic Parameter | Groundwater Standards, ug/l | | Analytical Results, ug/l | |
|-------------------------------|--------------------------------|-------|-----------------------------|------|
| | PAL | ES | 12/88 | 1/89 |
| Methylene chloride | 15 | 150 | X | X |
| 1,1 - Dichloroethylene | 0.024 | 0.24 | 32 | 5 |
| 1,1 - Dichloroethane | 85 | 850 | 50 | 15 |
| Chloroform | - | - | X | X |
| Carbon tetrachloride | - | - | X | X |
| 1,2 - Dichloropropane | - | - | X | X |
| Trichloroethylene (TCE) | 0.18 | 1.8 | 26 | 209 |
| 1,1,2 - Trichloroethane | 0.06 | 0.6 | X | X |
| Dibromochloromethane | - | - | X | X |
| Tetrachloroethylene | 0.1 | 1 | X | X |
| Chlorobenzene | - | - | X | X |
| Trans-1,2-Dichloroethylene | 20 | 100 | 21 | 2 |
| 1,2 - Dichloroethane | 0.05 | 0.5 | X | 2 |
| 1,1,1 - Trichloroethane | 40 | 200 | X | X |
| Bromodichloromethane | - | - | X | X |
| Benzene | 0.067 | 0.67 | 3 | X |
| Bromoform | - | - | X | X |
| 1,1,2,2-Tetrachloroethane | - | - | X | X |
| Toluene | 68.6 | 343 | X | X |
| Ethylbenzene | 272 | 1360 | X | X |
| Vinyl chloride | 0.0015 | 0.015 | 22 | X |
| Total xylene | 124 | 620 | X | X |
| 1,2-Dichlorobenzene | 125 | 1250 | X | X |
| 1,3-Dichlorobenzene | 125 | 1250 | X | X |
| 1,4-Dichlorobenzene | 150 | 750 | X | X |
| 2-Chloroethylvinyl Ether | - | - | X | X |
| Cis-1,2-Dichloroethylene | 10 | 100 | 570 | 118 |
| trans-1,3-dichloropropene | - | - | X | X |
| cis-1,3-dichloropropene | - | - | X | X |
| Total 1,2-Dichloroethylene | - | - | NA | NA |
| Bromoethane | - | - | NA | NA |
| Chloroethane | - | - | NA | NA |
| Chloromethane | - | - | NA | NA |
| Dichloromethane | - | - | NA | NA |
| Trichlorofluoromethane | 698 | 3490 | NA | NA |
| Dichlorodifluoromethane | - | - | NA | NA |

X - Analyzed for but not detected

NA - Not analyzed

PAL - Denotes Preventive Action Limit

ES - Denotes Enforcement Standard

US Army Reserve 84th Division
Groundwater Sampling and Analysis

Well Number P-112A

| Parameter | Groundwater Standards, mg/l | | Analytical Results, mg/l | |
|-------------|--------------------------------|----|-----------------------------|------|
| | PAL | ES | 12/88 | 1/89 |
| Indicators: | | | | |
| COD | 25 | - | <5 | <5 |
| BOD | 25 | - | <3 | <2 |
| Boron | 2 | - | 0.06 | 0.13 |
| Cond @ 25° | 200 | - | 1795 | 1563 |
| pH | +/-1 | - | 7.63 | 8.43 |
| Hardness | 100 | - | 773 | 670 |
| Alkalinity | 100 | - | 524 | 382 |
| NH3-N | 2 | - | <0.1 | <0.1 |

Public Health
and Welfare *

| | | | | |
|-----------|--------|-------|---------|---------|
| Chloride | 125 | 250 | 183 | 195 |
| Sulfates | 125 | 250 | 192 | 201 |
| Chromium | 0.005 | 0.05 | <0.002 | <0.002 |
| Mercury | 0.0002 | 0.002 | <0.0002 | <0.0002 |
| Lead | 0.005 | 0.05 | 0.033 | <0.002 |
| Cadmium | 0.001 | 0.01 | <0.001 | <0.001 |
| Arsenic | 0.005 | 0.05 | <0.001 | 0.001 |
| Dis Iron | 0.15 | 0.3 | 1.43 | 1.81 |
| NO2+NO3-N | 2 | 10 | <0.05 | <0.05 |
| Barium | 0.2 | 1 | 0.2 | 0.18 |

Notes:

PAL - Denotes Preventive Action Limit (Increase above background)
ES - Denotes Enforcement Standard

US Army Reserve 84th Division
Groundwater Sampling and Analysis

Well Number P-112A

| Volatile Organic Parameter | Groundwater Standards, ug/l | | Analytical Results, ug/l | |
|-------------------------------|--------------------------------|-------|-----------------------------|------|
| | PAL | ES | 12/88 | 1/89 |
| Methylene chloride | 15 | 150 | X | X |
| 1,1 - Dichloroethylene | 0.024 | 0.24 | 30 | 46 |
| 1,1 - Dichloroethane | 85 | 850 | 52 | 104 |
| Chloroform | - | - | X | X |
| Carbon tetrachloride | - | - | X | X |
| 1,2 - Dichloropropane | - | - | X | X |
| Trichloroethylene (TCE) | 0.18 | 1.8 | 36 | 56 |
| 1,1,2 - Trichloroethane | 0.06 | 0.6 | X | X |
| Dibromochloromethane | - | - | X | X |
| Tetrachloroethylene | 0.1 | 1 | X | X |
| Chlorobenzene | - | - | X | X |
| Trans-1,2-Dichloroethylene | 20 | 100 | 17 | 27 |
| 1,2 - Dichloroethane | 0.05 | 0.5 | X | 22 |
| 1,1,1 - Trichloroethane | 40 | 200 | X | X |
| Bromodichloromethane | - | - | X | X |
| Benzene | 0.067 | 0.67 | 3 | 4 |
| Bromoform | - | - | X | X |
| 1,1,2,2-Tetrachloroethane | - | - | X | X |
| Toluene | 68.6 | 343 | X | X |
| Ethylbenzene | 272 | 1360 | X | X |
| Vinyl chloride | 0.0015 | 0.015 | X | X |
| Total xylene | 124 | 620 | X | X |
| 1,2-Dichlorobenzene | 125 | 1250 | X | X |
| 1,3-Dichlorobenzene | 125 | 1250 | X | X |
| 1,4-Dichlorobenzene | 150 | 750 | X | X |
| 2-Chloroethylvinyl Ether | - | - | X | X |
| Cis-1,2-Dichloroethylene | 10 | 100 | 587 | 762 |
| trans-1,3-dichloropropene | - | - | X | X |
| cis-1,3-dichloropropene | - | - | X | X |
| Total 1,2-Dichloroethylene | - | - | NA | NA |
| Bromomethane | - | - | NA | NA |
| Chloroethane | - | - | NA | NA |
| Chloromethane | - | - | NA | NA |
| Dichloromethane | - | - | NA | NA |
| Trichlorofluoromethane | 698 | 3490 | NA | NA |
| Dichlorodifluoromethane | - | - | NA | NA |

X - Analyzed for but not detected

NA - Not analyzed

PAL - Denotes Preventive Action Limit

ES - Denotes Enforcement Standard

US Army Reserve 84th Division
Groundwater Sampling and Analysis

Well Number OW-113B

| Parameter | Groundwater Standards, mg/l | | Analytical Results, mg/l | |
|----------------------------|-----------------------------|-------|--------------------------|---------|
| | PAL | ES | 12/88 | 1/89 |
| Indicators: | | | | |
| COD | 25 | - | <5 | <5 |
| BOD | 25 | - | <2 | <2 |
| Boron | 2 | - | <0.05 | <0.05 |
| Cond @ 25° | 200 | - | 1056 | 860 |
| pH | +/-1 | - | 7.98 | 8.12 |
| Hardness | 100 | - | 503 | 478 |
| Alkalinity | 100 | - | 410 | 336 |
| NH3-N | 2 | - | <0.01 | 0.12 |
| Public Health and Welfare: | | | | |
| Chloride | 125 | 250 | 66.4 | 45.5 |
| Sulfates | 125 | 250 | 138 | 131 |
| Chromium | 0.005 | 0.05 | <0.002 | <0.002 |
| Mercury | 0.0002 | 0.002 | <0.0002 | <0.0002 |
| Lead | 0.005 | 0.05 | 0.019 | <0.002 |
| Cadmium | 0.001 | 0.01 | <0.001 | <0.001 |
| Arsenic | 0.005 | 0.05 | <0.001 | 0.002 |
| Dis Iron | 0.15 | 0.3 | 0.08 | 0.09 |
| NO2+NO3-N | 2 | 10 | <0.05 | <0.05 |
| Barium | 0.2 | 1 | 0.18 | 0.14 |

Notes:

PAL - Denotes Preventive Action Limit (Increase above background)
ES - Denotes Enforcement Standard

US Army Reserve 84th Division
Groundwater Sampling and Analysis

Well Number OW-113B

| Volatile Organic Parameter | Groundwater Standards, ug/l | | Analytical Results, ug/l | |
|-------------------------------|--------------------------------|-------|-----------------------------|------|
| | PAL | ES | 12/88 | 1/89 |
| Methylene chloride | 15 | 150 | X | 3 |
| 1,1 - Dichloroethylene | 0.024 | 0.24 | X | X |
| 1,1 - Dichloroethane | 85 | 850 | X | X |
| Chloroform | - | - | X | X |
| Carbon tetrachloride | - | - | X | X |
| 1,2 - Dichloropropane | - | - | X | X |
| Trichloroethylene (TCE) | 0.18 | 1.8 | X | X |
| 1,1,2 - Trichloroethane | 0.06 | 0.6 | X | X |
| Dibromochloromethane | - | - | X | X |
| Tetrachloroethylene | 0.1 | 1 | X | X |
| Chlorobenzene | - | - | X | X |
| Trans-1,2-Dichloroethylene | 20 | 100 | 0.5 | X |
| 1,2 - Dichloroethane | 0.05 | 0.5 | X | X |
| 1,1,1 - Trichloroethane | 40 | 200 | X | X |
| Bromodichloromethane | - | - | X | X |
| Benzene | 0.067 | 0.67 | X | X |
| Bromoform | - | - | X | X |
| 1,1,2,2-Tetrachloroethane | - | - | X | X |
| Toluene | 68.6 | 343 | X | X |
| Ethylbenzene | 272 | 1360 | X | X |
| Vinyl Chloride | 0.0015 | 0.015 | X | X |
| Total xylene | 124 | 620 | X | X |
| 1,2-Dichlorobenzene | 125 | 1250 | X | X |
| 1,3-Dichlorobenzene | 125 | 1250 | X | X |
| 1,4-Dichlorobenzene | 150 | 750 | X | X |
| 2-Chloroethylvinyl Ether | - | - | X | X |
| Cis-1,2-Dichloroethylene | 10 | 100 | X | 1.7 |
| trans-1,3-dichloropropene | - | - | X | X |
| cis-1,3-dichloropropene | - | - | X | X |
| Total 1,2-Dichloroethylene | - | - | NA | NA |
| Bromomethane | - | - | NA | NA |
| Chloroethane | - | - | NA | NA |
| Chloromethane | - | - | NA | NA |
| Dichloromethane | - | - | NA | NA |
| Trichlorofluoromethane | 698 | 3490 | NA | NA |
| Dichlorodifluoromethane | - | - | NA | NA |

X - Analyzed for but not detected

NA - Not analyzed

PAL - Denotes Preventive Action Limit

ES - Denotes Enforcement Standard

US Army Reserve B4th Division
Groundwater Sampling and Analysis

Well Number P-113A

| Parameter | Groundwater Standards, mg/l | | Analytical Results, mg/l | |
|-------------|-----------------------------|----|--------------------------|-------|
| | PAL | ES | 12/88 | 1/89 |
| Indicators: | | | | |
| COD | 25 | - | 5 | <5 |
| BOD | 25 | - | <2 | <2 |
| Boron | 2 | - | <0.05 | <0.05 |
| Cond @ 25° | 200 | - | 1096 | 1115 |
| pH | +/-1 | - | 7.98 | 9.24 |
| Hardness | 100 | - | 510 | 634 |
| Alkalinity | 100 | - | 328 | 426 |
| NH3-N | 2 | - | <0.1 | 0.12 |

Public Health
and Welfare:

| | | | | |
|-----------|--------|-------|---------|---------|
| Chloride | 125 | 250 | 46 | 52.6 |
| Sulfates | 125 | 250 | 325 | 301 |
| Chromium | 0.005 | 0.05 | <0.002 | <0.002 |
| Mercury | 0.0002 | 0.002 | <0.0002 | <0.0002 |
| Lead | 0.005 | 0.05 | 0.031 | <0.002 |
| Cadmium | 0.001 | 0.01 | <0.001 | <0.001 |
| Arsenic | 0.005 | 0.05 | <0.001 | 0.001 |
| Dis Iron | 0.15 | 0.3 | <0.05 | <0.05 |
| NO2+NO3-N | 2 | 10 | 0.07 | <0.05 |
| Barium | 0.2 | 1 | 0.24 | 0.22 |

Notes:

PAL - Denotes Preventive Action Limit (Increase above background)
ES - Denotes Enforcement Standard

US Army Reserve 84th Division
Groundwater Sampling and Analysis

Well Number P-113A

| Volatile Organic Parameter | Groundwater Standards, ug/l | | Analytical Results, ug/l | |
|-------------------------------|--------------------------------|-------|-----------------------------|------|
| | PAL | ES | 12/88 | 1/89 |
| Methylene chloride | 15 | 150 | X | 1.5 |
| 1,1 - Dichloroethylene | 0.024 | 0.24 | X | X |
| 1,1 - Dichloroethane | 85 | 850 | 0.2 | X |
| Chloroform | - | - | X | X |
| Carbon tetrachloride | - | - | X | X |
| 1,2 - Dichloropropane | - | - | 2 | X |
| Trichloroethylene (TCE) | 0.18 | 1.8 | X | X |
| 1,1,2 - Trichloroethane | 0.06 | 0.6 | 2 | X |
| Dibromochloromethane | - | - | 3 | X |
| Tetrachloroethylene | 0.1 | 1 | X | X |
| Chlorobenzene | - | - | X | X |
| Trans-1,2-Dichloroethylene | 20 | 100 | 0.9 | X |
| 1,2 - Dichloroethane | 0.05 | 0.5 | X | X |
| 1,1,1 - Trichloroethane | 40 | 200 | X | X |
| Bromodichloromethane | - | - | X | X |
| Benzene | 0.067 | 0.67 | X | X |
| Bromoform | - | - | 4 | X |
| 1,1,2,2-Tetrachloroethane | - | - | X | X |
| Toluene | 68.6 | 343 | X | X |
| Ethylbenzene | 272 | 1360 | X | X |
| Vinyl chloride | 0.0015 | 0.015 | X | X |
| Total xylene | 124 | 620 | 4 | X |
| 1,2-Dichlorobenzene | 125 | 1250 | 15 | X |
| 1,3-Dichlorobenzene | 125 | 1250 | 25 | X |
| 1,4-Dichlorobenzene | 150 | 750 | 12 | X |
| 2-Chloroethylvinyl Ether | - | - | X | X |
| Cis-1,2-Dichloroethylene | 10 | 100 | X | 10 |
| trans-1,3-dichloropropene | - | - | 1 | X |
| cis-1,3-dichloropropene | - | - | 2 | X |
| Total 1,2-Dichloroethylene | - | - | NA | NA |
| Bromomethane | - | - | NA | NA |
| Chloroethane | - | - | NA | NA |
| Chloromethane | - | - | NA | NA |
| Dichloromethane | - | - | NA | NA |
| Trichlorofluoromethane | 698 | 3490 | NA | NA |
| Dichlorodifluoromethane | - | - | NA | NA |

X - Analyzed for but not detected

NA - Not analyzed

PAL - Denotes Preventive Action Limit

ES - Denotes Enforcement Standard

Donohue

QUALITY CONTROL REPORT

U.S. Army Reserve 34th Division
(Samples 56844-56853, 56870 Analyzed 1/31/89)
(Samples 56871-56876 Analyzed 2/1/89)

SURROGATE RECOVERIES

| <u>Sample</u> | <u>% Recovery</u> <u>Trifluorotoluene</u> | <u>% Recovery</u> <u>1,4-Dichlorobutane</u> |
|---------------|--|--|
| 56844 | 101 | 91 |
| 56845 | 101 | 116 |
| 56846 | 88 | 114 |
| 56847 | | 139 |
| 56848 | 79 | 116 |
| 56849 | 88 | 111 |
| 56850 | 89 | 112 |
| 56851 | 101 | 113 |
| 56852 | 97 | 114 |
| 56853 | 92 | 114 |
| 56870 | 81 | 114 |
| 56871 | 125 | 131 |
| 56872 | | 121 |
| 56873 | 87 | 107 |
| 56874 | 108 | 104 |
| 56875 | 88 | 106 |
| 56876 | 96 | 109 |
| Blank | 98 | 114 |
| Spiked Blank | 80 | 116 |
| Spiked Blank | 96 | 113 |

Spike Recoveries

| <u>Compound</u> | <u>% Recovery</u> <u>Spike 1</u> | <u>% Recovery</u> <u>Spike 2</u> |
|-----------------------|-------------------------------------|-------------------------------------|
| 1,1,1-Trichloroethane | 112 | 96 |
| Carbontetrachloride | 94 | 79 |
| Benzene | 144 | 123 |
| 1,2-Dichloroethane | 105 | 98 |
| Trichloroethylene | 141 | 138 |
| 1,4-Dichlorobenzene | 145 | 168 |

Donohue

Inorganics
(Samples 56870-56875)

| <u>Analyte</u> | <u>Duplicate % RPD</u> | <u>Sample Spike % Recovery</u> | <u>Spike Blank % Recovery</u> | <u>External QC % Recovery</u> |
|----------------------|----------------------------|------------------------------------|-----------------------------------|-----------------------------------|
| BOD | 12 | NA | 100 | 103 |
| COD | 4 | 109 | 90 | 97 |
| Ammonia Nitrogen | 0 | 104 | 102 | 109 |
| Nitrate + Nitrite | 0 | 94 | 97 | 103 |
| Arsenic | 12 | 98 | 104 | 98 |
| Barium | 0 | 96 | 105 | 103 |
| Boron | 0 | 104 | 102 | NA |
| Cadmium | 0 | 91 | 104 | 83 |
| Chromium | 10 | 115 | 93 | 102 |
| Iron | 1 | 102 | 97 | 106 |
| Lead | 6 | 100 | 102 | 100 |
| Mercury | 1 | 81 | 60 | 83 |
| Alkalinity | 2 | 95 | 98 | 92 |
| Chloride | 0 | 100 | 96 | 99 |
| Sulfate | 2 | 111 | 104 | 106 |
| Hardness | 4 | 111 | 92 | 102 |

Analyses performed in accordance with
procedures approved by the U.S. EPA.

Greg Ruechel
QC Coordinator

3/10/89
Date

Donohue

QUALITY CONTROL REPORT

U.S. Army Reserve 84th Division
(Samples 56004-56012, Analyzed 1/3/89)
(Samples 56046-56052 Analyzed 1/4/89)

SURROGATE RECOVERIES

| <u>Sample</u> | <u>% Recovery</u> <u>Trifluorotoluene</u> | <u>% Recovery</u> <u>1,4-Dichlorobutane</u> |
|---------------|--|--|
| 56004 | 97 | 115 |
| 56005 | 109 | 130 |
| 56006 | 108 | 135 |
| 56007 | 103 | 125 |
| 56008 | 108 | 125 |
| 56009 | 102 | 125 |
| 56010 | 100 | 126 |
| 56011 | 105 | 120 |
| 56012 | 103 | 125 |
| Blank | 96 | 150 |
| 56046 | 107 | 100 |
| 56047 | 105 | 135 |
| 56048 | 107 | 110 |
| 56049 | 115 | 90 |
| 56050 | 109 | 90 |
| 56051 | 101 | 95 |
| 56052 | 102 | 95 |
| Blank | 81 | 135 |

Donohue Analytical
4738 North 40th Street
Sheboygan, Wisconsin 53083

Analytical & Field Services
414-458-8711

Donohue

Inorganics (Samples 56046-56051)

| <u>Analyte</u> | <u>Duplicate % RPD</u> | <u>Sample Spike % Recovery</u> | <u>Spike Blank % Recovery</u> | <u>External QC % Recovery</u> |
|----------------------|----------------------------|------------------------------------|-----------------------------------|-----------------------------------|
| BOD | 4 | NA | 94 | 102 |
| COD | 0 | 102 | 105 | 104 |
| Ammonia Nitrogen | 0 | 96 | 90 | 95 |
| Nitrate + Nitrite | 0 | 94 | 103 | 102 |
| Arsenic | 0 | 90 | 96 | 97 |
| Barium | 13 | 114 | 106 | 88 |
| Boron | 0 | 106 | 110 | NA |
| Cadmium | 0 | 81 | 98 | 113 |
| Chromium | 0 | 78 | 101 | 100 |
| Iron | 4 | 106 | 122 | 115 |
| Lead | 0 | 118 | 96 | 90 |
| Mercury | 0 | 103 | 103 | 82 |
| Alkalinity | 3 | 106 | 92 | 89 |
| Chloride | 1 | 93 | 95 | 100 |
| Sulfate | 0 | 103 | 106 | 100 |
| Hardness | 0 | 106 | 98 | 95 |

Analyses performed in accordance with
procedures approved by the U.S. EPA.

Ang Rachel
QC Coordinator

3/10/89
Date

Donohue

US Army Res. 84th Division

ATTN: Mr. Dave Voight

PROJECT NUMBER: 15977.007
COLLECTION DATA: Collected by Donohue
SAMPLE COLLECTED: SEE BELOW
SAMPLE RECEIVED: 12-21-88

NO. 56007 DESCRIPTION OW101B

TAKEN 12-21-88

| | | |
|----------------------------|-------------|-------|
| Color | Clear | |
| Odor | Yes; sulfur | |
| Turbidity | No | NTU |
| pH - Field | 7.45 | units |
| Methylene chloride | <1 | ug/l |
| 1,1 - Dichloroethylene | <1 | ug/l |
| 1,1 - Dichloroethane | 1 | ug/l |
| Chloroform | <1 | ug/l |
| Carbon tetrachloride | <1 | ug/l |
| 1,2 - Dichloropropane | <1 | ug/l |
| Trichloroethylene (TCE) | <0.5 | ug/l |
| 1,1,2 - Trichloroethane | <1 | ug/l |
| Dibromochloromethane | <1 | ug/l |
| Tetrachloroethylene | <1 | ug/l |
| Chlorobenzene | <1 | ug/l |
| Trans-1,2-Dichloroethylene | <0.5 | ug/l |
| 1,2 - Dichloroethane | <1 | ug/l |
| 1,1,1 - Trichloroethane | <1 | ug/l |
| Bromodichloromethane | <1 | ug/l |
| Benzene | <1 | ug/l |
| Bromoform | <1 | ug/l |
| 1,1,2,2-Tetrachloroethane | <1 | ug/l |
| Toluene | <1 | ug/l |
| Ethylbenzene | <1 | ug/l |
| Vinyl chloride | <2 | ug/l |
| Total Xylene | <2 | ug/l |
| 1,2-Dichlorobenzene | <1 | ug/l |
| 1,3-Dichlorobenzene | <1 | ug/l |
| 1,4-Dichlorobenzene | <1 | ug/l |
| 2-Chloroethylvinyl Ether | <1 | ug/l |
| Cis-1,2-Dichloroethylene | 49 | ug/l |
| trans-1,3-dichloropropene | <1 | ug/l |
| cis-1,3-dichloropropene | <1 | ug/l |

Analyses performed in accordance with
procedures approved by the U.S. EPA.
Certified by the State of Wisconsin DNR
Laboratory I.D. No. 460060920

Donohue Analytical
4738 North 40th Street
Sheboygan, Wisconsin 53083

Analytical & Field Services
414-458-8711

-----*Ken D. Hayes*----- 1-5-02-
Project Manager Date

Donohue

US Army Res. 84th Division

ATTN: Mr. Dave Voight

PROJECT NUMBER: 15977.007
COLLECTION DATA: Collected by Donohue
SAMPLE COLLECTED: SEE BELOW
SAMPLE RECEIVED: 12-21-88

NO. 56006 DESCRIPTION P101A

TAKEN 12-21-88

| | | |
|----------------------------|-------|-------|
| Color | Clear | |
| Odor | No | |
| Turbidity | No | NTU |
| pH - Field | 7.77 | units |
| Methylene chloride | <1 | ug/l |
| 1,1 - Dichloroethylene | <1 | ug/l |
| 1,1 - Dichloroethane | <0.5 | ug/l |
| Chloroform | <1 | ug/l |
| Carbon tetrachloride | <1 | ug/l |
| 1,2 - Dichloropropane | <1 | ug/l |
| Trichloroethylene (TCE) | <0.5 | ug/l |
| 1,1,2 - Trichloroethane | <1 | ug/l |
| Dibromochloromethane | <1 | ug/l |
| Tetrachloroethylene | <1 | ug/l |
| Chlorobenzene | <1 | ug/l |
| Trans-1,2-Dichloroethylene | <0.5 | ug/l |
| 1,2 - Dichloroethane | <1 | ug/l |
| 1,1,1 - Trichloroethane | <1 | ug/l |
| Bromodichloromethane | <1 | ug/l |
| Benzene | <1 | ug/l |
| Bromoform | <1 | ug/l |
| 1,1,2,2-Tetrachloroethane | <1 | ug/l |
| Toluene | <1 | ug/l |
| Ethylbenzene | <1 | ug/l |
| Vinyl chloride | <2 | ug/l |
| Total Xylene | <2 | ug/l |
| 1,2-Dichlorobenzene | <1 | ug/l |
| 1,3-Dichlorobenzene | <1 | ug/l |
| 1,4-Dichlorobenzene | <1 | ug/l |
| 2-Chloroethylvinyl Ether | <1 | ug/l |
| Cis-1,2-Dichloroethylene | <0.5 | ug/l |
| trans-1,3-dichloropropene | <1 | ug/l |
| cis-1,3-dichloropropene | <1 | ug/l |

Analyses performed in accordance with
procedures approved by the U.S. EPA.
Certified by the State of Wisconsin DNF
Laboratory I.D. No. 460060920

Donohue Analytical
4738 North 40th Street
Sheboygan, Wisconsin 53083

Analytical & Field Services
414-458-8711

Project Manager

Date

Donohue

US Army Res. 84th Division

ATTN: Mr. Dave Voight

PROJECT NUMBER: 15977.007
COLLECTION DATA: Collected by Donohue
SAMPLE COLLECTED: SEE BELOW
SAMPLE RECEIVED: 12-21-88

NO. 56005 DESCRIPTION OW102B

TAKEN 12-21-88

| | | |
|----------------------------|-------|-------|
| Color | Clear | |
| Odor | No | |
| Turbidity | No | NTU |
| pH - Field | 7.80 | units |
| Methylene chloride | <1 | ug/l |
| 1,1 - Dichloroethylene | <1 | ug/l |
| 1,1 - Dichloroethane | 1 | ug/l |
| Chloroform | <1 | ug/l |
| Carbon tetrachloride | <1 | ug/l |
| 1,2 - Dichloropropane | <1 | ug/l |
| Trichloroethylene (TCE) | 0.6 | ug/l |
| 1,1,2 - Trichloroethane | <1 | ug/l |
| Dibromochloromethane | <1 | ug/l |
| Tetrachloroethylene | <1 | ug/l |
| Chlorobenzene | <1 | ug/l |
| Trans-1,2-Dichloroethylene | <1 | ug/l |
| 1,2 - Dichloroethane | <1 | ug/l |
| 1,1,1 - Trichloroethane | <1 | ug/l |
| Bromodichloromethane | <1 | ug/l |
| Benzene | 1 | ug/l |
| Bromoform | <1 | ug/l |
| 1,1,2,2-Tetrachloroethane | <1 | ug/l |
| Toluene | <1 | ug/l |
| Ethylbenzene | <1 | ug/l |
| Vinyl chloride | <2 | ug/l |
| Total Xylene | 2 | ug/l |
| 1,2-Dichlorobenzene | <1 | ug/l |
| 1,3-Dichlorobenzene | <1 | ug/l |
| 1,4-Dichlorobenzene | <1 | ug/l |
| 2-Chloroethylvinyl Ether | <1 | ug/l |
| Cis-1,2-Dichloroethylene | 11 | ug/l |
| trans-1,3-dichloropropene | <1 | ug/l |
| cis-1,3-dichloropropene | <1 | ug/l |

Analyses performed in accordance with
procedures approved by the U.S. EPA.
Certified by the State of Wisconsin DNR
Laboratory I.D. No. 460060920

Donohue Analytical
4738 North 40th Street
Sheboygan, Wisconsin 53083

Analytical & Field Services
414-458-8711

Project Manager

15-88
Date

Donohue

US Army Res. 84th Division

ATTN: Mr. Dave Voight

PROJECT NUMBER: 15977.007
COLLECTION DATA: Collected by Donohue
SAMPLE COLLECTED: SEE BELOW
SAMPLE RECEIVED: 12-21-88

NO. 56004 DESCRIPTION P102A

TAKEN 12-21-88

| | | |
|----------------------------|------------|-------|
| Color | Light gray | |
| Odor | No | |
| Turbidity | Yes | NTU |
| pH - Field | 7.86 | units |
| Methylene chloride | <1 | ug/l |
| 1,1 - Dichloroethylene | <1 | ug/l |
| 1,1 - Dichloroethane | 2 | ug/l |
| Chloroform | <1 | ug/l |
| Carbon tetrachloride | <1 | ug/l |
| 1,2 - Dichloropropane | <1 | ug/l |
| Trichloroethylene (TCE) | <0.5 | ug/l |
| 1,1,2 - Trichloroethane | <1 | ug/l |
| Dibromochloromethane | 3 | ug/l |
| Tetrachloroethylene | <1 | ug/l |
| Chlorobenzene | <1 | ug/l |
| Trans-1,2-Dichloroethylene | <1 | ug/l |
| 1,2 - Dichloroethane | <1 | ug/l |
| 1,1,1 - Trichloroethane | <1 | ug/l |
| Bromodichloromethane | <1 | ug/l |
| Benzene | <1 | ug/l |
| Bromoform | 5 | ug/l |
| 1,1,2,2-Tetrachloroethane | <1 | ug/l |
| Toluene | <1 | ug/l |
| Ethylbenzene | <1 | ug/l |
| Vinyl chloride | <2 | ug/l |
| Total Xylene | 5 | ug/l |
| 1,2-Dichlorobenzene | 10 | ug/l |
| 1,3-Dichlorobenzene | 15 | ug/l |
| 1,4-Dichlorobenzene | 8 | ug/l |
| 2-Chloroethylvinyl Ether | <1 | ug/l |
| Cis-1,2-Dichloroethylene | 8 | ug/l |
| trans-1,3-dichloropropene | 1 | ug/l |
| cis-1,3-dichloropropene | 3 | ug/l |

Analyses performed in accordance with
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Laboratory I.D. No. 460060920

Donohue Analytical
4738 North 40th Street
Sheboygan, Wisconsin 53083

Analytical & Field Services
414-458-8711

Project Manager

1-5-89

Date

Donohue

US Army Res. 84th Division

ATTN: Mr. Dave Voight

PROJECT NUMBER: 15977.007
COLLECTION DATA: Collected by Donohue
SAMPLE COLLECTED: SEE BELOW
SAMPLE RECEIVED: 12-21-88

NO. 56011 DESCRIPTION OW105B

TAKEN 12-21-88

| | | |
|----------------------------|-------|-------|
| Color | Clear | |
| Odor | No | |
| Turbidity | No | NTU |
| pH - Field | 7.76 | units |
| Methylene chloride | <1 | ug/l |
| 1,1 - Dichloroethylene | <1 | ug/l |
| 1,1 - Dichloroethane | <0.5 | ug/l |
| Chloroform | <1 | ug/l |
| Carbon tetrachloride | <1 | ug/l |
| 1,2 - Dichloropropane | <1 | ug/l |
| Trichloroethylene (TCE) | <0.5 | ug/l |
| 1,1,2 - Trichloroethane | <1 | ug/l |
| Dibromochloromethane | <1 | ug/l |
| Tetrachloroethylene | <1 | ug/l |
| Chlorobenzene | <1 | ug/l |
| Trans-1,2-Dichloroethylene | <0.5 | ug/l |
| 1,2 - Dichloroethane | <1 | ug/l |
| 1,1,1 - Trichloroethane | <1 | ug/l |
| Bromodichloromethane | <1 | ug/l |
| Benzene | <1 | ug/l |
| Bromoform | <1 | ug/l |
| 1,1,2,2-Tetrachloroethane | <1 | ug/l |
| Toluene | <1 | ug/l |
| Ethylbenzene | <1 | ug/l |
| Vinyl chloride | <2 | ug/l |
| Total Xylene | <2 | ug/l |
| 1,2-Dichlorobenzene | <1 | ug/l |
| 1,3-Dichlorobenzene | <1 | ug/l |
| 1,4-Dichlorobenzene | <1 | ug/l |
| 2-Chloroethylvinyl Ether | <1 | ug/l |
| Cis-1,2-Dichloroethylene | <0.5 | ug/l |
| trans-1,3-dichloropropene | <1 | ug/l |
| cis-1,3-dichloropropene | <1 | ug/l |

Analyses performed in accordance with
procedures approved by the U.S. EPA.
Certified by the State of Wisconsin DNF
Laboratory I.D. No. 460060920

Donohue Analytical
4738 North 40th Street
Sheboygan, Wisconsin 53083

Analytical & Field Services
414-458-8711


Project Manager


Date

Donohue

US Army Reserve 84th Div.

ATTN: Mr. Dave Voight

PROJECT NUMBER: 15977.007
COLLECTION DATA: Collected by Donohue
SAMPLE COLLECTED: 12-22-88
SAMPLE RECEIVED: 12-22-88

SAMPLE NO: 56049
DESCRIPTION: P112A

| | | |
|----------------------------|-------|----------|
| Total BOD5 | <3 | mg/l |
| Total COD | <5 | mg/l |
| Ammonia Nitrogen | <0.1 | mg/l |
| Nitrate+Nitrite Nitrogen | <0.05 | mg/l |
| Arsenic | <1 | ug/l |
| Barium | 200 | ug/l |
| Boron | 60 | ug/l |
| Cadmium | <1 | ug/l |
| Chromium | <2 | ug/l |
| Iron | 1,430 | ug/l |
| Lead | 33 | ug/l |
| Mercury | <0.2 | ug/l |
| Alkalinity | 524 | mg/l |
| Total Hardness | 773 | mg/l |
| Chloride | 183 | mg/l |
| Sulfate | 192 | mg/l |
| Color | Clear | |
| Odor | No | |
| Turbidity | No | NTU |
| Specific Conductance-Field | 1,795 | umhos/cm |
| pH - Field | 7.63 | units |
| Methylene chloride | <1 | ug/l |
| 1,1 - Dichloroethylene | 30 | ug/l |
| 1,1 - Dichloroethane | 52 | ug/l |
| Chloroform | <1 | ug/l |
| Carbon tetrachloride | <1 | ug/l |
| 1,2 - Dichloropropane | <1 | ug/l |
| Trichloroethylene (TCE) | 36 | ug/l |
| 1,1,2 - Trichloroethane | <1 | ug/l |
| Dibromochloromethane | <1 | ug/l |
| Tetrachloroethylene | <1 | ug/l |
| Chlorobenzene | <1 | ug/l |
| Trans-1,2-Dichloroethylene | 17 | ug/l |
| 1,2 - Dichloroethane | <1 | ug/l |

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Sheboygan, Wisconsin 53083

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414-458-8711

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Laboratory I.D. No. 460060920

Project Manager

1-18-89
Date

Donohue

US Army Reserve 84th Div.

ATTN: Mr. Dave Voight

PROJECT NUMBER: 15977.007
COLLECTION DATA: Collected by Donohue
SAMPLE COLLECTED: 12-22-88
SAMPLE RECEIVED: 12-22-88

SAMPLE NO: 56049
DESCRIPTION: P112A

| | | |
|---------------------------|------------|------|
| 1,1,1 - Trichloroethane | <1 | ug/l |
| Bromodichloromethane | <1 | ug/l |
| Benzene | 3 | ug/l |
| Bromoform | <1 | ug/l |
| 1,1,2,2-Tetrachloroethane | <1 | ug/l |
| Toluene | <1 | ug/l |
| Ethylbenzene | <1 | ug/l |
| Vinyl chloride | <2 | ug/l |
| Total Xylene | <2 | ug/l |
| 1,2-Dichlorobenzene | <1 | ug/l |
| 1,3-Dichlorobenzene | <1 | ug/l |
| 1,4-Dichlorobenzene | <1 | ug/l |
| 2-Chloroethylvinyl Ether | <1 | ug/l |
| Cis-1,2-Dichloroethylene | 587 | ug/l |
| trans-1,3-dichloropropene | <1 | ug/l |
| cis-1,3-dichloropropene | <1 | ug/l |
| Temperature | 48 degrees | F |

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4738 North 40th Street
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Analyses performed in accordance with
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Certified by the State of Wisconsin DNR
Laboratory I.D. No. 460060920

Kerry R. Hayes
Project Manager

1-18-89

Date

Donohue

US Army Reserve 84th Div.

ATTN: Mr. Dave Voight

PROJECT NUMBER: 15977.007
COLLECTION DATA: Collected by Donohue
SAMPLE COLLECTED: 12-22-88
SAMPLE RECEIVED: 12-22-88

SAMPLE NO: 56047
DESCRIPTION: OW113B

| | | |
|----------------------------|------------|----------|
| Total BOD5 | <2 | mg/l |
| Total COD | <5 | mg/l |
| Ammonia Nitrogen | <0.1 | mg/l |
| Nitrate+Nitrite Nitrogen | <0.05 | mg/l |
| Arsenic | <1 | ug/l |
| Barium | 180 | ug/l |
| Boron | <50 | ug/l |
| Cadmium | <1 | ug/l |
| Chromium | <2 | ug/l |
| Iron | 80 | ug/l |
| Lead | 19 | ug/l |
| Mercury | <0.2 | ug/l |
| Alkalinity | 410 | mg/l |
| Total Hardness | 503 | mg/l |
| Chloride | 66.4 | mg/l |
| Sulfate | 138 | mg/l |
| Color | Gray silty | |
| Odor | No | |
| Turbidity | Yes | NTU |
| Specific Conductance-Field | 1,056 | umhos/cm |
| pH - Field | 7.98 | units |
| Methylene chloride | <1 | ug/l |
| 1,1 - Dichloroethylene | <1 | ug/l |
| 1,1 - Dichloroethane | <0.5 | ug/l |
| Chloroform | <1 | ug/l |
| Carbon tetrachloride | <1 | ug/l |
| 1,2 - Dichloropropane | <1 | ug/l |
| Trichloroethylene (TCE) | <0.5 | ug/l |
| 1,1,2 - Trichloroethane | <1 | ug/l |
| Dibromochloromethane | <1 | ug/l |
| Tetrachloroethylene | <1 | ug/l |
| Chlorobenzene | <1 | ug/l |
| Trans-1,2-Dichloroethylene | 0.5 | ug/l |
| 1,2 - Dichloroethane | <1 | ug/l |

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Laboratory I.D. No. 460060920

Ken S. Senger
Project Manager

1-18-89
Date

Donohue

US Army Reserve 84th Div.

ATTN: Mr. Dave Voight

PROJECT NUMBER: 15977.007
COLLECTION DATA: Collected by Donohue
SAMPLE COLLECTED: 12-22-88
SAMPLE RECEIVED: 12-22-88

SAMPLE NO: 56047
DESCRIPTION: OW113B

| | | |
|---------------------------|------------|------|
| 1,1,1 - Trichloroethane | <1 | ug/l |
| Bromodichloromethane | <1 | ug/l |
| Benzene | <1 | ug/l |
| Bromoform | <1 | ug/l |
| 1,1,2,2-Tetrachloroethane | <1 | ug/l |
| Toluene | <1 | ug/l |
| Ethylbenzene | <1 | ug/l |
| Vinyl chloride | <2 | ug/l |
| Total Xylene | <2 | ug/l |
| 1,2-Dichlorobenzene | <1 | ug/l |
| 1,3-Dichlorobenzene | <1 | ug/l |
| 1,4-Dichlorobenzene | <1 | ug/l |
| 2-Chloroethyl Vinyl Ether | <1 | ug/l |
| Cis-1,2-Dichloroethylene | <0.5 | ug/l |
| trans-1,3-dichloropropene | <1 | ug/l |
| cis-1,3-dichloropropene | <1 | ug/l |
| Temperature | 48 degrees | F |

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Sheboygan, Wisconsin 53083

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Laboratory I.D. No. 460060920



Project Manager



Date

Donohue

US Army Reserve 84th Div.

ATTN: Mr. Dave Voight

PROJECT NUMBER: 15977.007
COLLECTION DATA: Collected by Donohue
SAMPLE COLLECTED: 12-22-88
SAMPLE RECEIVED: 12-22-88

SAMPLE NO: 56046
DESCRIPTION: P113A

| | | |
|----------------------------|-------|----------|
| Total BOD5 | <2 | mg/l |
| Total COD | 5 | mg/l |
| Ammonia Nitrogen | <0.1 | mg/l |
| Nitrate+Nitrite Nitrogen | 0.07 | mg/l |
| Arsenic | <1 | ug/l |
| Barium | 240 | ug/l |
| Boron | <50 | ug/l |
| Cadmium | <1 | ug/l |
| Chromium | <2 | ug/l |
| Iron | <50 | ug/l |
| Lead | 31 | ug/l |
| Mercury | <0.2 | ug/l |
| Alkalinity | 328 | mg/l |
| Total Hardness | 510 | mg/l |
| Chloride | 46.0 | mg/l |
| Sulfate | 325 | mg/l |
| Color | Gray | |
| Odor | No | |
| Turbidity | Yes | NTU |
| Specific Conductance-Field | 1,096 | umhos/cm |
| pH - Field | 7.98 | units |
| Methylene chloride | <1 | ug/l |
| 1,1 - Dichloroethylene | <1 | ug/l |
| 1,1 - Dichloroethane | 0.2 | ug/l |
| Chloroform | <1 | ug/l |
| Carbon tetrachloride | <1 | ug/l |
| 1,2 - Dichloropropane | 2 | ug/l |
| Trichloroethylene (TCE) | <0.5 | ug/l |
| 1,1,2 - Trichloroethane | 2 | ug/l |
| Dibromochloromethane | 3 | ug/l |
| Tetrachloroethylene | <1 | ug/l |
| Chlorobenzene | <1 | ug/l |
| Trans-1,2-Dichloroethylene | 0.9 | ug/l |
| 1,2 - Dichloroethane | <1 | ug/l |

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Laboratory I.D. No. 460060920

Kerry A. Kupper
Project Manager

1-18-89
Date

Donohue

US Army Reserve 84th Div.

ATTN: Mr. Dave Voight

PROJECT NUMBER: 15977.007
COLLECTION DATA: Collected by Donohue
SAMPLE COLLECTED: 12-22-88
SAMPLE RECEIVED: 12-22-88

SAMPLE NO: 56049
DESCRIPTION: P112A

| | | |
|----------------------------|-------|----------|
| Total BOD5 | <3 | mg/l |
| Total COD | <5 | mg/l |
| Ammonia Nitrogen | <0.1 | mg/l |
| Nitrate+Nitrite Nitrogen | <0.05 | mg/l |
| Arsenic | <1 | ug/l |
| Barium | 200 | ug/l |
| Boron | 60 | ug/l |
| Cadmium | <1 | ug/l |
| Chromium | <2 | ug/l |
| Iron | 1,430 | ug/l |
| Lead | 33 | ug/l |
| Mercury | <0.2 | ug/l |
| Alkalinity | 524 | mg/l |
| Total Hardness | 773 | mg/l |
| Chloride | 183 | mg/l |
| Sulfate | 192 | mg/l |
| Color | Clear | |
| Odor | No | |
| Turbidity | No | NTU |
| Specific Conductance-Field | 1,795 | umhos/cm |
| pH - Field | 7.63 | units |
| Methylene chloride | <1 | ug/l |
| 1,1 - Dichloroethylene | 30 | ug/l |
| 1,1 - Dichloroethane | 52 | ug/l |
| Chloroform | <1 | ug/l |
| Carbon tetrachloride | <1 | ug/l |
| 1,2 - Dichloropropane | <1 | ug/l |
| Trichloroethylene (TCE) | 36 | ug/l |
| 1,1,2 - Trichloroethane | <1 | ug/l |
| Dibromochloromethane | <1 | ug/l |
| Tetrachloroethylene | <1 | ug/l |
| Chlorobenzene | <1 | ug/l |
| Trans-1,2-Dichloroethylene | 17 | ug/l |
| 1,2 - Dichloroethane | <1 | ug/l |

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4738 North 40th Street
Sheboygan, Wisconsin 53083

Analytical & Field Services
414-458-8711

Analyses performed in accordance with
procedures approved by the U.S. EPA.
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Laboratory I.D. No. 460060920

Kenneth A. Kuper
Project Manager

1-18-89
Date

Donohue

US Army Reserve 84th Div.

ATTN: Mr. Dave Voight

PROJECT NUMBER: 15977.007
COLLECTION DATA: Collected by Donohue
SAMPLE COLLECTED: 12-22-88
SAMPLE RECEIVED: 12-22-88

SAMPLE NO: 56049
DESCRIPTION: P112A

| | | |
|---------------------------|------------|------|
| 1,1,1 - Trichloroethane | <1 | ug/l |
| Bromodichloromethane | <1 | ug/l |
| Benzene | 3 | ug/l |
| Bromoform | <1 | ug/l |
| 1,1,2,2-Tetrachloroethane | <1 | ug/l |
| Toluene | <1 | ug/l |
| Ethylbenzene | <1 | ug/l |
| Vinyl chloride | <2 | ug/l |
| Total Xylene | <2 | ug/l |
| 1,2-Dichlorobenzene | <1 | ug/l |
| 1,3-Dichlorobenzene | <1 | ug/l |
| 1,4-Dichlorobenzene | <1 | ug/l |
| 2-Chloroethylvinyl Ether | <1 | ug/l |
| Cis-1,2-Dichloroethylene | 587 | ug/l |
| trans-1,3-dichloropropene | <1 | ug/l |
| cis-1,3-dichloropropene | <1 | ug/l |
| Temperature | 48 degrees | F |

Donohue Analytical
4738 North 40th Street
Sheboygan, Wisconsin 53083

Analytical & Field Services
414-458-8711

Analyses performed in accordance with
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Laboratory I.D. No. 460060920


Project Manager

1-18-89
Date

Donohue

US Army Reserve 84th Div.

ATTN: Mr. Dave Voight

PROJECT NUMBER: 15977.007
COLLECTION DATA: Collected by Donohue
SAMPLE COLLECTED: 12-22-88
SAMPLE RECEIVED: 12-22-88

SAMPLE NO: 56047
DESCRIPTION: OW113B

| | | |
|----------------------------|------------|----------|
| Total BOD5 | <2 | mg/l |
| Total COD | <5 | mg/l |
| Ammonia Nitrogen | <0.1 | mg/l |
| Nitrate+Nitrite Nitrogen | <0.05 | mg/l |
| Arsenic | <1 | ug/l |
| Barium | 180 | ug/l |
| Boron | <50 | ug/l |
| Cadmium | <1 | ug/l |
| Chromium | <2 | ug/l |
| Iron | 80 | ug/l |
| Lead | 19 | ug/l |
| Mercury | <0.2 | ug/l |
| Alkalinity | 410 | mg/l |
| Total Hardness | 503 | mg/l |
| Chloride | 66.4 | mg/l |
| Sulfate | 138 | mg/l |
| Color | Gray silty | |
| Odor | No | |
| Turbidity | Yes | NTU |
| Specific Conductance-Field | 1,056 | umhos/cm |
| pH - Field | 7.98 | units |
| Methylene chloride | <1 | ug/l |
| 1,1 - Dichloroethylene | <1 | ug/l |
| 1,1 - Dichloroethane | <0.5 | ug/l |
| Chloroform | <1 | ug/l |
| Carbon tetrachloride | <1 | ug/l |
| 1,2 - Dichloropropane | <1 | ug/l |
| Trichloroethylene (TCE) | <0.5 | ug/l |
| 1,1,2 - Trichloroethane | <1 | ug/l |
| Dibromochloromethane | <1 | ug/l |
| Tetrachloroethylene | <1 | ug/l |
| Chlorobenzene | <1 | ug/l |
| Trans-1,2-Dichloroethylene | 0.5 | ug/l |
| 1,2 - Dichloroethane | <1 | ug/l |

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Sheboygan, Wisconsin 53083

Analytical & Field Services
414-458-8711

Analyses performed in accordance with
procedures approved by the U.S. EPA.
Certified by the State of Wisconsin DR
Laboratory I.D. No. 460060920

Kerry Schaefer
Project Manager

1-18-89
Date

Donohue

US Army Reserve 84th Div.

ATTN: Mr. Dave Voight

PROJECT NUMBER: 15977.007
COLLECTION DATA: Collected by Donohue
SAMPLE COLLECTED: 12-22-88
SAMPLE RECEIVED: 12-22-88

SAMPLE NO: 56047
DESCRIPTION: OW113B

| | | |
|---------------------------|------------|------|
| 1,1,1 - Trichloroethane | <1 | ug/l |
| Bromodichloromethane | <1 | ug/l |
| Benzene | <1 | ug/l |
| Bromoform | <1 | ug/l |
| 1,1,2,2-Tetrachloroethane | <1 | ug/l |
| Toluene | <1 | ug/l |
| Ethylbenzene | <1 | ug/l |
| Vinyl chloride | <2 | ug/l |
| Total Xylene | <2 | ug/l |
| 1,2-Dichlorobenzene | <1 | ug/l |
| 1,3-Dichlorobenzene | <1 | ug/l |
| 1,4-Dichlorobenzene | <1 | ug/l |
| 2-Chloroethylvinyl Ether | <1 | ug/l |
| Cis-1,2-Dichloroethylene | <0.5 | ug/l |
| trans-1,3-dichloropropene | <1 | ug/l |
| cis-1,3-dichloropropene | <1 | ug/l |
| Temperature | 48 degrees | F |

Donohue Analytical
4738 North 40th Street
Sheboygan, Wisconsin 53083

Analytical & Field Services
414-458-8711

Analyses performed in accordance with
procedures approved by the U.S. EPA.
Certified by the State of Wisconsin DNR
Laboratory I.D. No. 460060920

Project Manager

1-12-89

Date

Donohue

US Army Reserve 84th Div.

ATTN: Mr. Dave Voight

PROJECT NUMBER: 15977.007
COLLECTION DATA: Collected by Donohue
SAMPLE COLLECTED: 12-22-88
SAMPLE RECEIVED: 12-22-88

SAMPLE NO: 56046
DESCRIPTION: P113A

| | | |
|----------------------------|-------|----------|
| Total BOD5 | <2 | mg/l |
| Total COD | 5 | mg/l |
| Ammonia Nitrogen | <0.1 | mg/l |
| Nitrate+Nitrite Nitrogen | 0.07 | mg/l |
| Arsenic | <1 | ug/l |
| Barium | 240 | ug/l |
| Boron | <50 | ug/l |
| Cadmium | <1 | ug/l |
| Chromium | <2 | ug/l |
| Iron | <50 | ug/l |
| Lead | 31 | ug/l |
| Mercury | <0.2 | ug/l |
| Alkalinity | 328 | mg/l |
| Total Hardness | 510 | mg/l |
| Chloride | 46.0 | mg/l |
| Sulfate | 325 | mg/l |
| Color | Gray | |
| Odor | No | |
| Turbidity | Yes | NTU |
| Specific Conductance-Field | 1,096 | umhos/cm |
| pH - Field | 7.98 | units |
| Methylene chloride | <1 | ug/l |
| 1,1 - Dichloroethylene | <1 | ug/l |
| 1,1 - Dichloroethane | 0.2 | ug/l |
| Chloroform | <1 | ug/l |
| Carbon tetrachloride | <1 | ug/l |
| 1,2 - Dichloropropane | 2 | ug/l |
| Trichloroethylene (TCE) | <0.5 | ug/l |
| 1,1,2 - Trichloroethane | 2 | ug/l |
| Dibromochloromethane | 3 | ug/l |
| Tetrachloroethylene | <1 | ug/l |
| Chlorobenzene | <1 | ug/l |
| Trans-1,2-Dichloroethylene | 0.9 | ug/l |
| 1,2 - Dichloroethane | <1 | ug/l |

Donohue Analytical
4738 North 40th Street
Sheboygan, Wisconsin 53083

Analytical & Field Services
414-458-8711

Analyses performed in accordance with
procedures approved by the U.S. EPA.
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Laboratory I.D. No. 460060920

Kerry A. Kuper
Project Manager

1-18-89
Date

Donohue

US Army Reserve 84th Div.

ATTN: Mr. Dave Voight

PROJECT NUMBER: 15977.007
COLLECTION DATA: Collected by Donohue
SAMPLE COLLECTED: 12-22-88
SAMPLE RECEIVED: 12-22-88

SAMPLE NO: 56046
DESCRIPTION: P113A

| | | |
|---------------------------|------------|------|
| 1,1,1 - Trichloroethane | <1 | ug/l |
| Bromodichloromethane | <1 | ug/l |
| Benzene | <1 | ug/l |
| Bromoform | 4 | ug/l |
| 1,1,2,2-Tetrachloroethane | <1 | ug/l |
| Toluene | <1 | ug/l |
| Ethylbenzene | <1 | ug/l |
| Vinyl chloride | <2 | ug/l |
| Total Xylene | 4 | ug/l |
| 1,2-Dichlorobenzene | 15 | ug/l |
| 1,3-Dichlorobenzene | 25 | ug/l |
| 1,4-Dichlorobenzene | 12 | ug/l |
| 2-Chloroethylvinyl Ether | <1 | ug/l |
| Cis-1,2-Dichloroethylene | <0.5 | ug/l |
| trans-1,3-dichloropropene | 1 | ug/l |
| cis-1,3-dichloropropene | 2 | ug/l |
| Temperature | 48 degrees | F |

Donohue Analytical
4738 North 40th Street
Sheboygan, Wisconsin 53083

Analytical & Field Services
414-458-8711

Analyses performed in accordance with
procedures approved by the U.S. EPA.
Certified by the State of Wisconsin DM.
Laboratory I.D. No. 460060920

Project Manager

1-18-89

Date

Donohue

US Army Res. 84th Division

ATTN: Mr. Dave Voight

PROJECT NUMBER: 15977.007
COLLECTION DATA: Collected by Donohue
SAMPLE COLLECTED: SEE BELOW
SAMPLE RECEIVED: 12-21-88

NO. 56012 DESCRIPTION Field Blank

TAKEN 12-21-88

| | | |
|----------------------------|------|-------|
| Color | NA | |
| Odor | NA | |
| Turbidity | NA | NTU |
| pH - Field | NA | units |
| Methylene chloride | <1 | ug/l |
| 1,1 - Dichloroethylene | <1 | ug/l |
| 1,1 - Dichloroethane | <0.5 | ug/l |
| Chloroform | <1 | ug/l |
| Carbon tetrachloride | <1 | ug/l |
| 1,2 - Dichloropropane | <1 | ug/l |
| Trichloroethylene (TCE) | <0.5 | ug/l |
| 1,1,2 - Trichloroethane | <1 | ug/l |
| Dibromochloromethane | <1 | ug/l |
| Tetrachloroethylene | <1 | ug/l |
| Chlorobenzene | <1 | ug/l |
| Trans-1,2-Dichloroethylene | <0.5 | ug/l |
| 1,2 - Dichloroethane | <1 | ug/l |
| 1,1,1 - Trichloroethane | <1 | ug/l |
| Bromodichloromethane | <1 | ug/l |
| Benzene | <1 | ug/l |
| Bromoform | <1 | ug/l |
| 1,1,2,2-Tetrachloroethane | <1 | ug/l |
| Toluene | <1 | ug/l |
| Ethylbenzene | <1 | ug/l |
| Vinyl chloride | <2 | ug/l |
| Total Xylene | <2 | ug/l |
| 1,2-Dichlorobenzene | <1 | ug/l |
| 1,3-Dichlorobenzene | <1 | ug/l |
| 1,4-Dichlorobenzene | <1 | ug/l |
| 2-Chloroethylvinyl Ether | <1 | ug/l |
| Cis-1,2-Dichloroethylene | <0.5 | ug/l |
| trans-1,3-dichloropropene | <1 | ug/l |
| cis-1,3-dichloropropene | <1 | ug/l |

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4738 North 40th Street
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Analytical & Field Services
414-458-8711

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Certified by the State of Wisconsin DNR
Laboratory I.D. No. 460060920

Project Manager

Date

Donohue

US Army Reserve 84th Div.

ATTN: Mr. Dave Voight

PROJECT NUMBER: 15977.007
COLLECTION DATA: Collected by Donohue
SAMPLE COLLECTED: 12-22-88
SAMPLE RECEIVED: 12-22-88

SAMPLE NO: 56048
DESCRIPTION: 114A

| | | |
|----------------------------|------------|----------|
| Total BOD5 | <2 | mg/l |
| Total COD | <5 | mg/l |
| Ammonia Nitrogen | <0.1 | mg/l |
| Nitrate+Nitrite Nitrogen | <0.05 | mg/l |
| Arsenic | 1 | ug/l |
| Barium | 150 | ug/l |
| Boron | <50 | ug/l |
| Cadmium | <1 | ug/l |
| Chromium | <2 | ug/l |
| Iron | <50 | ug/l |
| Lead | 19 | ug/l |
| Mercury | <0.2 | ug/l |
| Alkalinity | 450 | mg/l |
| Total Hardness | 500 | mg/l |
| Chloride | 67.6 | mg/l |
| Sulfate | 136 | mg/l |
| Color | Gray silty | |
| Odor | No | |
| Turbidity | Yes | NTU |
| Specific Conductance-Field | 1,056 | umhos/cm |
| pH - Field | 7.98 | units |
| Methylene chloride | <1 | ug/l |
| 1,1 - Dichloroethylene | <1 | ug/l |
| 1,1 - Dichloroethane | <0.5 | ug/l |
| Chloroform | <1 | ug/l |
| Carbon tetrachloride | <1 | ug/l |
| 1,2 - Dichloropropane | <1 | ug/l |
| Trichloroethylene (TCE) | <1 | ug/l |
| 1,1,2 - Trichloroethane | <1 | ug/l |
| Dibromochloromethane | <1 | ug/l |
| Tetrachloroethylene | <1 | ug/l |
| Chlorobenzene | <1 | ug/l |
| Trans-1,2-Dichloroethylene | <0.5 | ug/l |
| 1,2 - Dichloroethane | <1 | ug/l |

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4738 North 40th Street
Sheboygan, Wisconsin 53083

Analytical & Field Services
414-458-8711

Analyses performed in accordance with
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Certified by the State of Wisconsin DI
Laboratory I.D. No. 460060920

Project Manager

1-18-89

Date

Donohue

US Army Reserve 84th Div.

ATTN: Mr. Dave Voight

PROJECT NUMBER: 15977.007
COLLECTION DATA: Collected by Donohue
SAMPLE COLLECTED: 12-22-88
SAMPLE RECEIVED: 12-22-88

SAMPLE NO: 56048
DESCRIPTION: 114A

| | | |
|---------------------------|------------|------|
| 1,1,1 - Trichloroethane | <1 | ug/l |
| Bromodichloromethane | <1 | ug/l |
| Benzene | <1 | ug/l |
| Bromoform | <1 | ug/l |
| 1,1,2,2-Tetrachloroethane | <1 | ug/l |
| Toluene | <1 | ug/l |
| Ethylbenzene | <1 | ug/l |
| Vinyl chloride | <2 | ug/l |
| Total Xylene | <2 | ug/l |
| 1,2-Dichlorobenzene | <1 | ug/l |
| 1,3-Dichlorobenzene | <1 | ug/l |
| 1,4-Dichlorobenzene | <1 | ug/l |
| 2-Chloroethylvinyl Ether | <1 | ug/l |
| Cis-1,2-Dichloroethylene | <0.5 | ug/l |
| trans-1,3-dichloropropene | <1 | ug/l |
| cis-1,3-dichloropropene | <1 | ug/l |
| Temperature | 48 degrees | F |

Donohue Analytical
4738 North 40th Street
Sheboygan, Wisconsin 53083

Analytical & Field Services
414-458-8711

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Certified by the State of Wisconsin DN
Laboratory I.D. No. 460060920

Kerry DeKasper

Project Manager

1/8/89

Date

Donohue

US Army Reserve 84th Div.

ATTN: Mr. Dave Voight

PROJECT NUMBER: 15977.007
COLLECTION DATA: Collected by Donohue
SAMPLE COLLECTED: 12-22-88
SAMPLE RECEIVED: 12-22-88

SAMPLE NO: 56051
DESCRIPTION: Field Blank

| | | |
|----------------------------|-------|----------|
| Total BOD5 | 2 | mg/l |
| Total COD | <5 | mg/l |
| Ammonia Nitrogen | <0.1 | mg/l |
| Nitrate+Nitrite Nitrogen | <0.05 | mg/l |
| Arsenic | <1 | ug/l |
| Barium | <100 | ug/l |
| Boron | <50 | ug/l |
| Cadmium | <1 | ug/l |
| Chromium | <2 | ug/l |
| Iron | 60 | ug/l |
| Lead | <2 | ug/l |
| Mercury | <0.2 | ug/l |
| Alkalinity | <5.0 | mg/l |
| Total Hardness | <5.0 | mg/l |
| Chloride | <0.50 | mg/l |
| Sulfate | <2.0 | mg/l |
| Color | NA | |
| Odor | NA | |
| Turbidity | NA | NTU |
| Specific Conductance-Field | NA | umhos/cm |
| pH - Field | NA | units |
| Methylene chloride | <1 | ug/l |
| 1,1 - Dichloroethylene | <1 | ug/l |
| 1,1 - Dichloroethane | <0.5 | ug/l |
| Chloroform | <1 | ug/l |
| Carbon tetrachloride | <1 | ug/l |
| 1,2 - Dichloropropane | <1 | ug/l |
| Trichloroethylene (TCE) | <1 | ug/l |
| 1,1,2 - Trichloroethane | <1 | ug/l |
| Dibromochloromethane | <1 | ug/l |
| Tetrachloroethylene | <1 | ug/l |
| Chlorobenzene | <1 | ug/l |
| Trans-1,2-Dichloroethylene | 0.8 | ug/l |
| 1,2 - Dichloroethane | <1 | ug/l |

Donohue Analytical
4738 North 40th Street
Sheboygan, Wisconsin 53083

Analytical & Field Services
414-458-8711

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Certified by the State of Wisconsin DN.
Laboratory I.D. No. 460060920

Ken C. Kasper
Project Manager

1-18-89
Date

Donohue

US Army Reserve 84th Div.

ATTN: Mr. Dave Voight

PROJECT NUMBER: 15977.007
COLLECTION DATA: Collected by Donohue
SAMPLE COLLECTED: 12-22-88
SAMPLE RECEIVED: 12-22-88

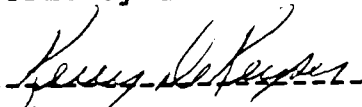
SAMPLE NO: 56051
DESCRIPTION: Field Blank

| | | |
|---------------------------|----|------|
| 1,1,1 - Trichloroethane | <1 | ug/l |
| Bromodichloromethane | <1 | ug/l |
| Benzene | <1 | ug/l |
| Bromoform | <1 | ug/l |
| 1,1,2,2-Tetrachloroethane | <1 | ug/l |
| Toluene | <1 | ug/l |
| Ethylbenzene | <1 | ug/l |
| Vinyl chloride | <2 | ug/l |
| Total Xylene | <2 | ug/l |
| 1,2-Dichlorobenzene | <1 | ug/l |
| 1,3-Dichlorobenzene | <1 | ug/l |
| 1,4-Dichlorobenzene | <1 | ug/l |
| 2-Chloroethyl vinyl Ether | <1 | ug/l |
| Cis-1,2-Dichloroethylene | 7 | ug/l |
| trans-1,3-dichloropropene | <1 | ug/l |
| cis-1,3-dichloropropene | <1 | ug/l |
| Temperature | NA | F |

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Sheboygan, Wisconsin 53083

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Laboratory I.D. No. 460060920


Project Manager

1-18-89
Date

Donohue

US Army Reserve 84th Div.

ATTN: Mr. Dave Voight

PROJECT NUMBER: 15977.007
COLLECTION DATA: Collected by Donohue
SAMPLE COLLECTED: 12-22-88
SAMPLE RECEIVED: 12-22-88

SAMPLE NO: 56052
DESCRIPTION: Trip Blank

| | | |
|----------------------------|------|------|
| Methylene chloride | <1 | ug/l |
| 1,1 - Dichloroethylene | <1 | ug/l |
| 1,1 - Dichloroethane | <0.5 | ug/l |
| Chloroform | <1 | ug/l |
| Carbon tetrachloride | <1 | ug/l |
| 1,2 - Dichloropropane | <1 | ug/l |
| Trichloroethylene (TCE) | <1 | ug/l |
| 1,1,2 - Trichloroethane | <1 | ug/l |
| Dibromochloromethane | <1 | ug/l |
| Tetrachloroethylene | <1 | ug/l |
| Chlorobenzene | <1 | ug/l |
| Trans-1,2-Dichloroethylene | <0.5 | ug/l |
| 1,2 - Dichloroethane | <1 | ug/l |
| 1,1,1 - Trichloroethane | <1 | ug/l |
| Bromodichloromethane | <1 | ug/l |
| Benzene | <1 | ug/l |
| Bromoform | <1 | ug/l |
| 1,1,2,2-Tetrachloroethane | <1 | ug/l |
| Toluene | <1 | ug/l |
| Ethylbenzene | <1 | ug/l |
| Vinyl chloride | <2 | ug/l |
| Total Xylene | <2 | ug/l |
| 1,2-Dichlorobenzene | <1 | ug/l |
| 1,3-Dichlorobenzene | <1 | ug/l |
| 1,4-Dichlorobenzene | <1 | ug/l |
| 2-Chloroethylvinyl Ether | <1 | ug/l |
| Cis-1,2-Dichloroethylene | <0.5 | ug/l |
| trans-1,3-dichloropropene | <1 | ug/l |
| cis-1,3-dichloropropene | <1 | ug/l |

Donohue Analytical
4738 North 40th Street
Sheboygan, Wisconsin 53083

Analytical & Field Services
414-458-8711

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Certified by the State of Wisconsin DNR
Laboratory I.D. No. 460060920

Project Manager

1-7-89
Date

Donohue

U.S. Army Reserve

ATTN: Mr. Dave Voight

PROJECT NUMBER: 15977.007
COLLECTION DATA: Collected by Donohue
SAMPLE COLLECTED: SEE BELOW
SAMPLE RECEIVED: 01-23-89

1. 56845 DESCRIPTION OW101B

TAKEN 01-23-89

| | | |
|----------------------------|------|------|
| Methylene chloride | 2 | ug/l |
| 1,1 - Dichloroethylene | <1 | ug/l |
| 1,1 - Dichloroethane | 3 | ug/l |
| Chloroform | <1 | ug/l |
| Carbon tetrachloride | <1 | ug/l |
| 1,2 - Dichloropropane | <1 | ug/l |
| Trichloroethylene (TCE) | <0.5 | ug/l |
| 1,1,2 - Trichloroethane | <1 | ug/l |
| Dibromochloromethane | <1 | ug/l |
| Tetrachloroethylene | <1 | ug/l |
| Chlorobenzene | <1 | ug/l |
| Trans-1,2-Dichloroethylene | <0.5 | ug/l |
| 1,2 - Dichloroethane | <1 | ug/l |
| 1,1,1 - Trichloroethane | <1 | ug/l |
| Bromodichloromethane | <1 | ug/l |
| Benzene | <1 | ug/l |
| Bromoform | <1 | ug/l |
| 1,1,2,2-Tetrachloroethane | <1 | ug/l |
| Toluene | <1 | ug/l |
| Ethylbenzene | <1 | ug/l |
| Vinyl chloride | <2 | ug/l |
| Total Xylene | <2 | ug/l |
| 1,2-Dichlorobenzene | <1 | ug/l |
| 1,3-Dichlorobenzene | <1 | ug/l |
| 1,4-Dichlorobenzene | <1 | ug/l |
| 2-Chloroethylvinyl Ether | <1 | ug/l |
| Cis-1,2-Dichloroethylene | 86 | ug/l |
| trans-1,3-dichloropropene | <1 | ug/l |
| cis-1,3-dichloropropene | <1 | ug/l |

Donohue Analytical
4738 North 40th Street
Sheboygan, Wisconsin 53083

Analytical & Field Services
414-458-8711

Analyses performed in accordance with
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Certified by the State of Wisconsin DNR
Laboratory I.D. No. 460060920

-----*Kerry R. Kuyper*----- 2-6-89
Project Manager Date

Donohue

U.S. Army Reserve

ATTN: Mr. Dave Voight

PROJECT NUMBER: 15977.007
COLLECTION DATA: Collected by Donohue
SAMPLE COLLECTED: SEE BELOW
SAMPLE RECEIVED: 01-23-89

1. 56844 DESCRIPTION P101A

TAKEN 01-23-89

| | | |
|----------------------------|------|------|
| Methylene chloride | 6 | ug/l |
| 1,1 - Dichloroethylene | <1 | ug/l |
| 1,1 - Dichloroethane | <0.5 | ug/l |
| Chloroform | <1 | ug/l |
| Carbon tetrachloride | <1 | ug/l |
| 1,2 - Dichloropropane | <1 | ug/l |
| Trichloroethylene (TCE) | <0.5 | ug/l |
| 1,1,2 - Trichloroethane | <1 | ug/l |
| Dibromochloromethane | <1 | ug/l |
| Tetrachloroethylene | <1 | ug/l |
| Chlorobenzene | <1 | ug/l |
| Trans-1,2-Dichloroethylene | <0.5 | ug/l |
| 1,2 - Dichloroethane | 2 | ug/l |
| 1,1,1 - Trichloroethane | <1 | ug/l |
| Bromodichloromethane | <1 | ug/l |
| Benzene | <1 | ug/l |
| Bromoform | <1 | ug/l |
| 1,1,2,2-Tetrachloroethane | <1 | ug/l |
| Toluene | <1 | ug/l |
| Ethylbenzene | <1 | ug/l |
| Vinyl chloride | <2 | ug/l |
| Total Xylene | <2 | ug/l |
| 1,2-Dichlorobenzene | <1 | ug/l |
| 1,3-Dichlorobenzene | <1 | ug/l |
| 1,4-Dichlorobenzene | 3 | ug/l |
| 2-Chloroethylvinyl Ether | <1 | ug/l |
| Cis-1,2-Dichloroethylene | <0.5 | ug/l |
| trans-1,3-dichloropropene | <1 | ug/l |
| cis-1,3-dichloropropene | <1 | ug/l |

Donohue Analytical
4738 North 40th Street
Sheboygan, Wisconsin 53083

Analytical & Field Services
414-458-8711

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Certified by the State of Wisconsin DN
Laboratory, I.D. No. 460060920

Project Manager

2-6-89
Date

Donohue

U.S. Army Reserve

ATTN: Mr. Dave Voight

PROJECT NUMBER: 15977.007
COLLECTION DATA: Collected by Donohue
SAMPLE COLLECTED: SEE BELOW
SAMPLE RECEIVED: 01-23-89

NO. 56846 DESCRIPTION OW102B

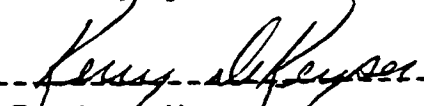
TAKEN 01-23-89

| | | |
|----------------------------|------|------|
| Methylene chloride | 3 | ug/l |
| 1,1 - Dichloroethylene | <1 | ug/l |
| 1,1 - Dichloroethane | 3 | ug/l |
| Chloroform | <1 | ug/l |
| Carbon tetrachloride | <1 | ug/l |
| 1,2 - Dichloropropane | <1 | ug/l |
| Trichloroethylene (TCE) | <0.5 | ug/l |
| 1,1,2 - Trichloroethane | <1 | ug/l |
| Dibromochloromethane | <1 | ug/l |
| Tetrachloroethylene | <1 | ug/l |
| Chlorobenzene | <1 | ug/l |
| Trans-1,2-Dichloroethylene | <0.5 | ug/l |
| 1,2 - Dichloroethane | <1 | ug/l |
| 1,1,1 - Trichloroethane | <1 | ug/l |
| Bromodichloromethane | <1 | ug/l |
| Benzene | <1 | ug/l |
| Bromoform | <1 | ug/l |
| 1,1,2,2-Tetrachloroethane | <1 | ug/l |
| Toluene | <1 | ug/l |
| Ethylbenzene | <1 | ug/l |
| Vinyl chloride | <2 | ug/l |
| Total Xylene | <2 | ug/l |
| 1,2-Dichlorobenzene | <1 | ug/l |
| 1,3-Dichlorobenzene | <1 | ug/l |
| 1,4-Dichlorobenzene | <1 | ug/l |
| 2-Chloroethylvinyl Ether | <1 | ug/l |
| Cis-1,2-Dichloroethylene | 16 | ug/l |
| trans-1,3-dichloropropene | <1 | ug/l |
| cis-1,3-dichloropropene | <1 | ug/l |

Donohue Analytical
4738 North 40th Street
Sheboygan, Wisconsin 53083

Analytical & Field Services
414-458-8711

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Certified by the State of Wisconsin DNR
Laboratory I.D. No. 460060920


Project Manager


Date

Donohue

U.S. Army Reserve

ATTN: Mr. Dave Voight

PROJECT NUMBER: 15977.007
COLLECTION DATA: Collected by Donohue
SAMPLE COLLECTED: SEE BELOW
SAMPLE RECEIVED: 01-23-89

NO. 56847 DESCRIPTION P102A

TAKEN 01-23-89

| | | |
|----------------------------|------|------|
| Methylene chloride | 10 | ug/l |
| 1,1 - Dichloroethylene | <1 | ug/l |
| 1,1 - Dichloroethane | 7 | ug/l |
| Chloroform | <1 | ug/l |
| Carbon tetrachloride | <1 | ug/l |
| 1,2 - Dichloropropane | <1 | ug/l |
| Trichloroethylene (TCE) | 8 | ug/l |
| 1,1,2 - Trichloroethane | 5 | ug/l |
| Dibromochloromethane | 2 | ug/l |
| Tetrachloroethylene | <1 | ug/l |
| Chlorobenzene | 3 | ug/l |
| Trans-1,2-Dichloroethylene | <0.5 | ug/l |
| 1,2 - Dichloroethane | 5 | ug/l |
| 1,1,1 - Trichloroethane | <1 | ug/l |
| Bromodichloromethane | 5 | ug/l |
| Benzene | <1 | ug/l |
| Bromoform | <1 | ug/l |
| 1,1,2,2-Tetrachloroethane | <1 | ug/l |
| Toluene | <1 | ug/l |
| Ethylbenzene | <1 | ug/l |
| Vinyl chloride | <2 | ug/l |
| Total Xylene | 5 | ug/l |
| 1,2-Dichlorobenzene | 18 | ug/l |
| 1,3-Dichlorobenzene | 14 | ug/l |
| 1,4-Dichlorobenzene | 14 | ug/l |
| 2-Chloroethylvinyl Ether | <1 | ug/l |
| Cis-1,2-Dichloroethylene | 30 | ug/l |
| trans-1,3-dichloropropene | <1 | ug/l |
| cis-1,3-dichloropropene | <1 | ug/l |

Donohue Analytical
4738 North 40th Street
Sheboygan, Wisconsin 53083

Analytical & Field Services
414-458-8711

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Certified by the State of Wisconsin DNR
Laboratory I.D. No. 460060920


Project Manager


Date

Donohue

U.S. Army Reserve

ATTN: Mr. Dave Voight

PROJECT NUMBER: 15977.007
COLLECTION DATA: Collected by Donohue
SAMPLE COLLECTED: SEE BELOW
SAMPLE RECEIVED: 01-23-89

NO. 56850 DESCRIPTION OW105B

TAKEN 01-23-89

| | | |
|----------------------------|-----|------|
| Methylene chloride | 7 | ug/l |
| 1,1 - Dichloroethylene | <1 | ug/l |
| 1,1 - Dichloroethane | 4.8 | ug/l |
| Chloroform | <1 | ug/l |
| Carbon tetrachloride | 3 | ug/l |
| 1,2 - Dichloropropane | <1 | ug/l |
| Trichloroethylene (TCE) | 3.1 | ug/l |
| 1,1,2 - Trichloroethane | 3 | ug/l |
| Dibromochloromethane | <1 | ug/l |
| Tetrachloroethylene | 2 | ug/l |
| Chlorobenzene | 2 | ug/l |
| Trans-1,2-Dichloroethylene | 2.4 | ug/l |
| 1,2 - Dichloroethane | 6 | ug/l |
| 1,1,1 - Trichloroethane | 6 | ug/l |
| Bromodichloromethane | 2 | ug/l |
| Benzene | <1 | ug/l |
| Bromoform | <1 | ug/l |
| 1,1,2,2-Tetrachloroethane | <1 | ug/l |
| Toluene | <1 | ug/l |
| Ethylbenzene | <1 | ug/l |
| Vinyl chloride | <2 | ug/l |
| Total Xylene | 3 | ug/l |
| 1,2-Dichlorobenzene | 6 | ug/l |
| 1,3-Dichlorobenzene | 5 | ug/l |
| 1,4-Dichlorobenzene | 3 | ug/l |
| 2-Chloroethylvinyl Ether | <1 | ug/l |
| Cis-1,2-Dichloroethylene | 6.6 | ug/l |
| trans-1,3-dichloropropene | <1 | ug/l |
| cis-1,3-dichloropropene | <1 | ug/l |

Donohue Analytical
4738 North 40th Street
Sheboygan, Wisconsin 53083

Analytical & Field Services
414-458-8711

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Certified by the State of Wisconsin DN
Laboratory I.D. No. 460060920

Kerry S. Saylor
Project Manager

2-6-89
Date

Donohue

U.S. Army Reserve

ATTN: Mr. Dave Voight

PROJECT NUMBER: 15977.007
COLLECTION DATA: Collected by Donohue
SAMPLE COLLECTED: SEE BELOW
SAMPLE RECEIVED: 01-23-89

NO. 56851 DESCRIPTION P105A

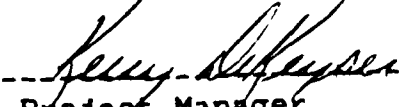
TAKEN 01-23-89

| | | |
|----------------------------|------|------|
| Methylene chloride | 2 | ug/l |
| 1,1 - Dichloroethylene | <1 | ug/l |
| 1,1 - Dichloroethane | <0.5 | ug/l |
| Chloroform | <1 | ug/l |
| Carbon tetrachloride | <1 | ug/l |
| 1,2 - Dichloropropane | <1 | ug/l |
| Trichloroethylene (TCE) | 1.2 | ug/l |
| 1,1,2 - Trichloroethane | <1 | ug/l |
| Dibromochloromethane | <1 | ug/l |
| Tetrachloroethylene | <1 | ug/l |
| Chlorobenzene | <1 | ug/l |
| Trans-1,2-Dichloroethylene | 0.5 | ug/l |
| 1,2 - Dichloroethane | 4 | ug/l |
| 1,1,1 - Trichloroethane | <1 | ug/l |
| Bromodichloromethane | <1 | ug/l |
| Benzene | <1 | ug/l |
| Bromoform | <1 | ug/l |
| 1,1,2,2-Tetrachloroethane | <1 | ug/l |
| Toluene | <1 | ug/l |
| Ethylbenzene | <1 | ug/l |
| Vinyl chloride | <2 | ug/l |
| Total Xylene | <2 | ug/l |
| 1,2-Dichlorobenzene | 6 | ug/l |
| 1,3-Dichlorobenzene | <1 | ug/l |
| 1,4-Dichlorobenzene | 4 | ug/l |
| 2-Chloroethylvinyl Ether | <1 | ug/l |
| Cis-1,2-Dichloroethylene | 20 | ug/l |
| trans-1,3-dichloropropene | <1 | ug/l |
| cis-1,3-dichloropropene | <1 | ug/l |

Donohue Analytical
4738 North 40th Street
Sheboygan, Wisconsin 53083

Analytical & Field Services
414-458-8711

Analyses performed in accordance with
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Certified by the State of Wisconsin DNR
Laboratory I.D. No. 460060920


Project Manager


Date

Donohue

U.S. Army Reserve

ATTN: Mr. Dave Voight

PROJECT NUMBER: 15977.007
COLLECTION DATA: Collected by Donohue
SAMPLE COLLECTED: SEE BELOW
SAMPLE RECEIVED: 01-23-89

NO. 56849 DESCRIPTION OW106B

TAKEN 01-23-89

| | | |
|----------------------------|------|------|
| Methylene chloride | 5 | ug/l |
| 1,1 - Dichloroethylene | <1 | ug/l |
| 1,1 - Dichloroethane | 0.9 | ug/l |
| Chloroform | 3 | ug/l |
| Carbon tetrachloride | <1 | ug/l |
| 1,2 - Dichloropropane | <1 | ug/l |
| Trichloroethylene (TCE) | 0.7 | ug/l |
| 1,1,2 - Trichloroethane | 3 | ug/l |
| Dibromochloromethane | <1 | ug/l |
| Tetrachloroethylene | <1 | ug/l |
| Chlorobenzene | <1 | ug/l |
| Trans-1,2-Dichloroethylene | <0.5 | ug/l |
| 1,2 - Dichloroethane | 2 | ug/l |
| 1,1,1 - Trichloroethane | <1 | ug/l |
| Bromodichloromethane | 2 | ug/l |
| Benzene | <1 | ug/l |
| Bromoform | <1 | ug/l |
| 1,1,2,2-Tetrachloroethane | <1 | ug/l |
| Toluene | <1 | ug/l |
| Ethylbenzene | <1 | ug/l |
| Vinyl chloride | <2 | ug/l |
| Total Xylene | <2 | ug/l |
| 1,2-Dichlorobenzene | 10 | ug/l |
| 1,3-Dichlorobenzene | 8 | ug/l |
| 1,4-Dichlorobenzene | 8 | ug/l |
| 2-Chloroethylvinyl Ether | <1 | ug/l |
| Cis-1,2-Dichloroethylene | 4 | ug/l |
| trans-1,3-dichloropropene | <1 | ug/l |
| cis-1,3-dichloropropene | <1 | ug/l |

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Laboratory I.D. No. 460060920

Project Manager

2-6-89
Date

Donohue

U.S. Army Reserve

ATTN: Mr. Dave Voight

PROJECT NUMBER: 15977.007
COLLECTION DATA: Collected by Donohue
SAMPLE COLLECTED: SEE BELOW
SAMPLE RECEIVED: 01-23-89

NO. 56848 DESCRIPTION P106A

TAKEN 01-23-89

| | | |
|----------------------------|------|------|
| Methylene chloride | 9 | ug/l |
| 1,1 - Dichloroethylene | <1 | ug/l |
| 1,1 - Dichloroethane | 2 | ug/l |
| Chloroform | 5 | ug/l |
| Carbon tetrachloride | <1 | ug/l |
| 1,2 - Dichloropropane | <1 | ug/l |
| Trichloroethylene (TCE) | <0.5 | ug/l |
| 1,1,2 - Trichloroethane | 6 | ug/l |
| Dibromochloromethane | 3 | ug/l |
| Tetrachloroethylene | <1 | ug/l |
| Chlorobenzene | 2 | ug/l |
| Trans-1,2-Dichloroethylene | <0.5 | ug/l |
| 1,2 - Dichloroethane | 5 | ug/l |
| 1,1,1 - Trichloroethane | <1 | ug/l |
| Bromodichloromethane | 4 | ug/l |
| Benzene | <1 | ug/l |
| Bromoform | 2 | ug/l |
| 1,1,2,2-Tetrachloroethane | <1 | ug/l |
| Toluene | <1 | ug/l |
| Ethylbenzene | <1 | ug/l |
| Vinyl chloride | <2 | ug/l |
| Total Xylene | 4 | ug/l |
| 1,2-Dichlorobenzene | 17 | ug/l |
| 1,3-Dichlorobenzene | 12 | ug/l |
| 1,4-Dichlorobenzene | 12 | ug/l |
| 2-Chloroethylvinyl Ether | <1 | ug/l |
| Cis-1,2-Dichloroethylene | 10 | ug/l |
| trans-1,3-dichloropropene | <1 | ug/l |
| cis-1,3-dichloropropene | <1 | ug/l |

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Laboratory I.D. No. 460060920

Kerry A. Kypar
Project Manager

2-6-89
Date

Donohue

U.S. Army Reserve

ATTN: Mr. Dave Voight

PROJECT NUMBER: 15977.007
COLLECTION DATA: Collected by Donohue
SAMPLE COLLECTED: 01-24-89
SAMPLE RECEIVED: 01-24-89

SAMPLE NO: 56874
DESCRIPTION: OW112B

| | | |
|----------------------------|-------|------|
| Total BOD5 | <2 | mg/l |
| Total COD | <5 | mg/l |
| Ammonia Nitrogen | <0.1 | mg/l |
| Nitrate+Nitrite Nitrogen | <0.05 | mg/l |
| Arsenic | 2 | ug/l |
| Barium | 180 | ug/l |
| Boron | 160 | ug/l |
| Cadmium | <1 | ug/l |
| Chromium | <2 | ug/l |
| Iron | 870 | ug/l |
| Lead | <2 | ug/l |
| Mercury | <0.2 | ug/l |
| Alkalinity | 376 | mg/l |
| Total Hardness | 600 | mg/l |
| Chloride | 23.5 | mg/l |
| Sulfate | 226 | mg/l |
| Methylene chloride | <1 | ug/l |
| 1,1 - Dichloroethylene | 5 | ug/l |
| 1,1 - Dichloroethane | 15 | ug/l |
| Chloroform | <1 | ug/l |
| Carbon tetrachloride | <1 | ug/l |
| 1,2 - Dichloropropane | <1 | ug/l |
| Trichloroethylene (TCE) | 209 | ug/l |
| 1,1,2 - Trichloroethane | <1 | ug/l |
| Dibromochloromethane | <1 | ug/l |
| Tetrachloroethylene | <1 | ug/l |
| Chlorobenzene | <1 | ug/l |
| Trans-1,2-Dichloroethylene | 2.0 | ug/l |
| 1,2 - Dichloroethane | 2 | ug/l |
| 1,1,1 - Trichloroethane | <1 | ug/l |
| Bromodichloromethane | <1 | ug/l |
| Benzene | <1 | ug/l |
| Bromoform | <1 | ug/l |
| 1,1,2,2-Tetrachloroethane | <1 | ug/l |

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Project Manager

2-24-89
Date

Donohue

U.S. Army Reserve

ATTN: Mr. Dave Voight

PROJECT NUMBER: 15977.007
COLLECTION DATA: Collected by Donohue
SAMPLE COLLECTED: 01-24-89
SAMPLE RECEIVED: 01-24-89

SAMPLE NO: 56874
DESCRIPTION: OW112B

| | | |
|---------------------------|-----|------|
| Toluene | <1 | ug/l |
| Ethylbenzene | <1 | ug/l |
| Vinyl chloride | <2 | ug/l |
| Total Xylene | <2 | ug/l |
| 1,2-Dichlorobenzene | <1 | ug/l |
| 1,3-Dichlorobenzene | <1 | ug/l |
| 1,4-Dichlorobenzene | <1 | ug/l |
| 2-Chloroethylvinyl Ether | <1 | ug/l |
| Cis-1,2-Dichloroethylene | 118 | ug/l |
| trans-1,3-dichloropropene | <1 | ug/l |
| cis-1,3-dichloropropene | <1 | ug/l |

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Laboratory I.D. No. 460060920

-----*Kerry Olsen*----- 2-14-89
Project Manager Date

Donohue

U.S. Army Reserve

ATTN: Mr. Dave Voight

PROJECT NUMBER: 15977.007
COLLECTION DATA: Collected by Donohue
SAMPLE COLLECTED: 01-24-89
SAMPLE RECEIVED: 01-24-89

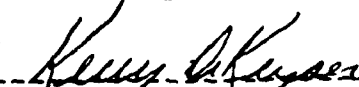
SAMPLE NO: 56872
DESCRIPTION: P112A

| | | |
|----------------------------|-------|------|
| Total BOD5 | <2 | mg/l |
| Total COD | <5 | mg/l |
| Ammonia Nitrogen | <0.1 | mg/l |
| Nitrate+Nitrite Nitrogen | <0.05 | mg/l |
| Arsenic | 1 | ug/l |
| Barium | 180 | ug/l |
| Boron | 130 | ug/l |
| Cadmium | <1 | ug/l |
| Chromium | <2 | ug/l |
| Iron | 1,810 | ug/l |
| Lead | <2 | ug/l |
| Mercury | <0.2 | ug/l |
| Alkalinity | 382 | mg/l |
| Total Hardness | 670 | mg/l |
| Chloride | 195 | mg/l |
| Sulfate | 201 | mg/l |
| Methylene chloride | <1 | ug/l |
| 1,1 - Dichloroethylene | 46 | ug/l |
| 1,1 - Dichloroethane | 104 | ug/l |
| Chloroform | <1 | ug/l |
| Carbon tetrachloride | <1 | ug/l |
| 1,2 - Dichloropropane | <1 | ug/l |
| Trichloroethylene (TCE) | 56 | ug/l |
| 1,1,2 - Trichloroethane | <1 | ug/l |
| Dibromochloromethane | <1 | ug/l |
| Tetrachloroethylene | <1 | ug/l |
| Chlorobenzene | <1 | ug/l |
| Trans-1,2-Dichloroethylene | 27 | ug/l |
| 1,2 - Dichloroethane | 22 | ug/l |
| 1,1,1 - Trichloroethane | <1 | ug/l |
| Bromodichloromethane | <1 | ug/l |
| Benzene | 4 | ug/l |
| Bromoform | <1 | ug/l |
| 1,1,2,2-Tetrachloroethane | <1 | ug/l |

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Project Manager

2-14-89
Date

Donohue

U.S. Army Reserve

ATTN: Mr. Dave Voight

PROJECT NUMBER: 15977.007
COLLECTION DATA: Collected by Donohue
SAMPLE COLLECTED: 01-24-89
SAMPLE RECEIVED: 01-24-89

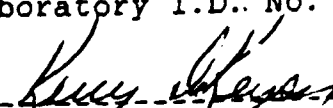
SAMPLE NO: 56872
DESCRIPTION: P112A

| | | |
|---------------------------|-----|------|
| Toluene | <1 | ug/l |
| Ethylbenzene | <1 | ug/l |
| Vinyl chloride | <2 | ug/l |
| Total Xylene | <2 | ug/l |
| 1,2-Dichlorobenzene | <1 | ug/l |
| 1,3-Dichlorobenzene | <1 | ug/l |
| 1,4-Dichlorobenzene | <1 | ug/l |
| 2-Chloroethylvinyl Ether | <1 | ug/l |
| Cis-1,2-Dichloroethylene | 762 | ug/l |
| trans-1,3-dichloropropene | <1 | ug/l |
| cis-1,3-dichloropropene | <1 | ug/l |

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Project Manager

2-14-89

Date

Donohue

U.S. Army Reserve

ATTN: Mr. Dave Voight

PROJECT NUMBER: 15977.007
COLLECTION DATA: Collected by Donohue
SAMPLE COLLECTED: 01-24-89
SAMPLE RECEIVED: 01-24-89

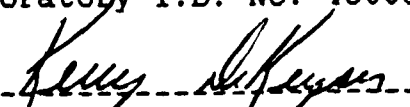
SAMPLE NO: 56871
DESCRIPTION: OW113B

| | | |
|----------------------------|-------|------|
| Total BOD5 | <2 | mg/l |
| Total COD | <5 | mg/l |
| Ammonia Nitrogen | 0.12 | mg/l |
| Nitrate+Nitrite Nitrogen | <0.05 | mg/l |
| Arsenic | 2 | ug/l |
| Barium | 140 | ug/l |
| Boron | <50 | ug/l |
| Cadmium | <1 | ug/l |
| Chromium | <2 | ug/l |
| Iron | 90 | ug/l |
| Lead | <2 | ug/l |
| Mercury | <0.2 | ug/l |
| Alkalinity | 336 | mg/l |
| Total Hardness | 478 | mg/l |
| Chloride | 45.5 | mg/l |
| Sulfate | 131 | mg/l |
| Methylene chloride | 3 | ug/l |
| 1,1 - Dichloroethylene | <1 | ug/l |
| 1,1 - Dichloroethane | <0.5 | ug/l |
| Chloroform | <1 | ug/l |
| Carbon tetrachloride | <1 | ug/l |
| 1,2 - Dichloropropane | <1 | ug/l |
| Trichloroethylene (TCE) | <0.5 | ug/l |
| 1,1,2 - Trichloroethane | <1 | ug/l |
| Dibromochloromethane | <1 | ug/l |
| Tetrachloroethylene | <1 | ug/l |
| Chlorobenzene | <1 | ug/l |
| Trans-1,2-Dichloroethylene | <0.5 | ug/l |
| 1,2 - Dichloroethane | <1 | ug/l |
| 1,1,1 - Trichloroethane | <1 | ug/l |
| Bromodichloromethane | <1 | ug/l |
| Benzene | <1 | ug/l |
| Bromoform | <1 | ug/l |
| 1,1,2,2-Tetrachloroethane | <1 | ug/l |

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Laboratory I.D. No. 460060920


Project Manager

2-14-89
Date

Donohue

U.S. Army Reserve

ATTN: Mr. Dave Voight

PROJECT NUMBER: 15977.007
COLLECTION DATA: Collected by Donohue
SAMPLE COLLECTED: 01-24-89
SAMPLE RECEIVED: 01-24-89

SAMPLE NO: 56871
DESCRIPTION: OW113B

| | | |
|---------------------------|-----|------|
| Toluene | <1 | ug/l |
| Ethylbenzene | <1 | ug/l |
| Vinyl chloride | <2 | ug/l |
| Total Xylene | <2 | ug/l |
| 1,2-Dichlorobenzene | <1 | ug/l |
| 1,3-Dichlorobenzene | <1 | ug/l |
| 1,4-Dichlorobenzene | <1 | ug/l |
| 2-Chloroethylvinyl Ether | <1 | ug/l |
| Cis-1,2-Dichloroethylene | 1.7 | ug/l |
| trans-1,3-dichloropropene | <1 | ug/l |
| cis-1,3-dichloropropene | <1 | ug/l |

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-----*Kerry A. Ryan*-----
Project Manager
-----2-14-89-----
Date

Donohue

U.S. Army Reserve

ATTN: Mr. Dave Voight

PROJECT NUMBER: 15977.007
COLLECTION DATA: Collected by Donohue
SAMPLE COLLECTED: 01-24-89
SAMPLE RECEIVED: 01-24-89

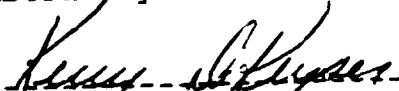
SAMPLE NO: 56870
DESCRIPTION: P113A

| | | |
|----------------------------|-------|------|
| Total BOD5 | <2 | mg/l |
| Total COD | <5 | mg/l |
| Ammonia Nitrogen | 0.12 | mg/l |
| Nitrate+Nitrite Nitrogen | <0.05 | mg/l |
| Arsenic | 1 | ug/l |
| Barium | 220 | ug/l |
| Boron | <50 | ug/l |
| Cadmium | <1 | ug/l |
| Chromium | <2 | ug/l |
| Iron | <50 | ug/l |
| Lead | <2 | ug/l |
| Mercury | <0.2 | ug/l |
| Alkalinity | 426 | mg/l |
| Total Hardness | 634 | mg/l |
| Chloride | 52.6 | mg/l |
| Sulfate | 301 | mg/l |
| Methylene chloride | 1.5 | ug/l |
| 1,1 - Dichloroethylene | <1 | ug/l |
| 1,1 - Dichloroethane | <0.5 | ug/l |
| Chloroform | <1 | ug/l |
| Carbon tetrachloride | <1 | ug/l |
| 1,2 - Dichloropropane | <1 | ug/l |
| Trichloroethylene (TCE) | <0.5 | ug/l |
| 1,1,2 - Trichloroethane | <1 | ug/l |
| Dibromochloromethane | <1 | ug/l |
| Tetrachloroethylene | <1 | ug/l |
| Chlorobenzene | <1 | ug/l |
| Trans-1,2-Dichloroethylene | <0.5 | ug/l |
| 1,2 - Dichloroethane | <1 | ug/l |
| 1,1,1 - Trichloroethane | <1 | ug/l |
| Bromodichloromethane | <1 | ug/l |
| Benzene | <1 | ug/l |
| Bromoform | <1 | ug/l |
| 1,1,2,2-Tetrachloroethane | <1 | ug/l |

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Project Manager

2-14-89
Date

Donohue

U.S. Army Reserve

ATTN: Mr. Dave Voight

PROJECT NUMBER: 15977.007
COLLECTION DATA: Collected by Donohue
SAMPLE COLLECTED: 01-24-89
SAMPLE RECEIVED: 01-24-89

SAMPLE NO: 56870
DESCRIPTION: P113A

| | | |
|---------------------------|----|------|
| Toluene | <1 | ug/l |
| Ethylbenzene | <1 | ug/l |
| Vinyl chloride | <2 | ug/l |
| Total Xylene | <2 | ug/l |
| 1,2-Dichlorobenzene | <1 | ug/l |
| 1,3-Dichlorobenzene | <1 | ug/l |
| 1,4-Dichlorobenzene | <1 | ug/l |
| 2-Chloroethylvinyl Ether | <1 | ug/l |
| Cis-1,2-Dichloroethylene | 10 | ug/l |
| trans-1,3-dichloropropene | <1 | ug/l |
| cis-1,3-dichloropropene | <1 | ug/l |

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-----*Kenneth A. Jensen*-----
Project Manager

2-14-89

Date

Donohue

U.S. Army Reserve

ATTN: Mr. Dave Voight

PROJECT NUMBER: 15977.007
COLLECTION DATA: Collected by Donohue
SAMPLE COLLECTED: SEE BELOW
SAMPLE RECEIVED: 01-23-89

NO. 56852 DESCRIPTION Field Blank

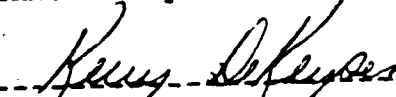
TAKEN 01-23-89

| | | |
|----------------------------|------|------|
| Methylene chloride | 6 | ug/l |
| 1,1 - Dichloroethylene | <1 | ug/l |
| 1,1 - Dichloroethane | <0.5 | ug/l |
| Chloroform | <1 | ug/l |
| Carbon tetrachloride | <1 | ug/l |
| 1,2 - Dichloropropane | <1 | ug/l |
| Trichloroethylene (TCE) | 1.1 | ug/l |
| 1,1,2 - Trichloroethane | <1 | ug/l |
| Dibromochloromethane | <1 | ug/l |
| Tetrachloroethylene | <1 | ug/l |
| Chlorobenzene | <1 | ug/l |
| Trans-1,2-Dichloroethylene | <0.5 | ug/l |
| 1,2 - Dichloroethane | <1 | ug/l |
| 1,1,1 - Trichloroethane | <1 | ug/l |
| Bromodichloromethane | <1 | ug/l |
| Benzene | <1 | ug/l |
| Bromoform | <1 | ug/l |
| 1,1,2,2-Tetrachloroethane | <1 | ug/l |
| Toluene | <1 | ug/l |
| Ethylbenzene | <1 | ug/l |
| Vinyl chloride | <2 | ug/l |
| Total Xylene | <2 | ug/l |
| 1,2-Dichlorobenzene | <1 | ug/l |
| 1,3-Dichlorobenzene | <1 | ug/l |
| 1,4-Dichlorobenzene | <1 | ug/l |
| 2-Chloroethylvinyl Ether | <1 | ug/l |
| Cis-1,2-Dichloroethylene | 0.6 | ug/l |
| trans-1,3-dichloropropene | <1 | ug/l |
| cis-1,3-dichloropropene | <1 | ug/l |

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Laboratory I.D. No, 460060920


Project Manager

2-6-89
Date

Donohue

U.S. Army Reserve

ATTN: Mr. Dave Voight

PROJECT NUMBER: 15977.007
COLLECTION DATA: Collected by Donohue
SAMPLE COLLECTED: SEE BELOW
SAMPLE RECEIVED: 01-23-89

NO. 56853 DESCRIPTION Trip Blank

TAKEN 01-23-89

| | | |
|----------------------------|------|------|
| Methylene chloride | 43 | ug/l |
| 1,1 - Dichloroethylene | <1 | ug/l |
| 1,1 - Dichloroethane | <0.5 | ug/l |
| Chloroform | 4 | ug/l |
| Carbon tetrachloride | <1 | ug/l |
| 1,2 - Dichloropropane | <1 | ug/l |
| Trichloroethylene (TCE) | <0.5 | ug/l |
| 1,1,2 - Trichloroethane | <1 | ug/l |
| Dibromochloromethane | <1 | ug/l |
| Tetrachloroethylene | <1 | ug/l |
| Chlorobenzene | <1 | ug/l |
| Trans-1,2-Dichloroethylene | <0.5 | ug/l |
| 1,2 - Dichloroethane | 1.3 | ug/l |
| 1,1,1 - Trichloroethane | <1 | ug/l |
| Bromodichloromethane | <1 | ug/l |
| Benzene | <1 | ug/l |
| Bromoform | <1 | ug/l |
| 1,1,2,2-Tetrachloroethane | <1 | ug/l |
| Toluene | <1 | ug/l |
| Ethylbenzene | <1 | ug/l |
| Vinyl chloride | <2 | ug/l |
| Total Xylene | <2 | ug/l |
| 1,2-Dichlorobenzene | <1 | ug/l |
| 1,3-Dichlorobenzene | <1 | ug/l |
| 1,4-Dichlorobenzene | 3 | ug/l |
| 2-Chloroethylvinyl Ether | <1 | ug/l |
| Cis-1,2-Dichloroethylene | <0.5 | ug/l |
| trans-1,3-dichloropropene | <1 | ug/l |
| cis-1,3-dichloropropene | <1 | ug/l |

Donohue Analytical
4738 North 40th Street
Sheboygan, Wisconsin 53083

Analytical & Field Services
414-458-8711

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Certified by the State of Wisconsin DNR
Laboratory I.D. No. 460060920


Project Manager


Date

Donohue

U.S. Army Reserve

ATTN: Mr. Dave Voight

PROJECT NUMBER: 15977.007
COLLECTION DATA: Collected by Donohue
SAMPLE COLLECTED: 01-24-89
SAMPLE RECEIVED: 01-24-89

SAMPLE NO: 56873
DESCRIPTION: P122B

| | | |
|----------------------------|-------|------|
| Total BOD5 | <2 | mg/l |
| Total COD | <5 | mg/l |
| Ammonia Nitrogen | <0.1 | mg/l |
| Nitrate+Nitrite Nitrogen | <0.05 | mg/l |
| Arsenic | <1 | ug/l |
| Barium | 160 | ug/l |
| Boron | 220 | ug/l |
| Cadmium | <1 | ug/l |
| Chromium | <2 | ug/l |
| Iron | 1,810 | ug/l |
| Lead | <2 | ug/l |
| Mercury | <0.2 | ug/l |
| Alkalinity | 388 | mg/l |
| Total Hardness | 688 | mg/l |
| Chloride | 231 | mg/l |
| Sulfate | 181 | mg/l |
| Methylene chloride | <1 | ug/l |
| 1,1 - Dichloroethylene | 20 | ug/l |
| 1,1 - Dichloroethane | 38 | ug/l |
| Chloroform | 23 | ug/l |
| Carbon tetrachloride | <1 | ug/l |
| 1,2 - Dichloropropane | <1 | ug/l |
| Trichloroethylene (TCE) | 28 | ug/l |
| 1,1,2 - Trichloroethane | <1 | ug/l |
| Dibromochloromethane | <1 | ug/l |
| Tetrachloroethylene | <1 | ug/l |
| Chlorobenzene | <1 | ug/l |
| Trans-1,2-Dichloroethylene | 12.2 | ug/l |
| 1,2 - Dichloroethane | <1 | ug/l |
| 1,1,1 - Trichloroethane | <1 | ug/l |
| Bromodichloromethane | 2 | ug/l |
| Benzene | <1 | ug/l |
| Bromoform | <1 | ug/l |
| 1,1,2,2-Tetrachloroethane | <1 | ug/l |

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Project Manager

2-14-89
Date

Donohue

U.S. Army Reserve

ATTN: Mr. Dave Voight

PROJECT NUMBER: 15977.007
COLLECTION DATA: Collected by Donohue
SAMPLE COLLECTED: 01-24-89
SAMPLE RECEIVED: 01-24-89

SAMPLE NO: 56873
DESCRIPTION: P122B

| | | |
|---------------------------|-----|------|
| Toluene | <1 | ug/l |
| Ethylbenzene | <1 | ug/l |
| Vinyl chloride | <2 | ug/l |
| Total Xylene | <2 | ug/l |
| 1,2-Dichlorobenzene | <1 | ug/l |
| 1,3-Dichlorobenzene | <1 | ug/l |
| 1,4-Dichlorobenzene | <1 | ug/l |
| 2-Chloroethylvinyl Ether | <1 | ug/l |
| Cis-1,2-Dichloroethylene | 422 | ug/l |
| trans-1,3-dichloropropene | <1 | ug/l |
| cis-1,3-dichloropropene | <1 | ug/l |

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Project Manager

2-14-89
Date

Donohue

U.S. Army Reserve

ATTN: Mr. Dave Voight

PROJECT NUMBER: 15977.007
COLLECTION DATA: Collected by Donohue
SAMPLE COLLECTED: 01-24-89
SAMPLE RECEIVED: 01-24-89

SAMPLE NO: 56875
DESCRIPTION: Field Blank

| | | |
|----------------------------|-------|------|
| Total BOD5 | <2 | mg/l |
| Total COD | <5 | mg/l |
| Ammonia Nitrogen | <0.1 | mg/l |
| Nitrate+Nitrite Nitrogen | <0.05 | mg/l |
| Arsenic | <1 | ug/l |
| Barium | <100 | ug/l |
| Boron | <50 | ug/l |
| Cadmium | <1 | ug/l |
| Chromium | <2 | ug/l |
| Iron | <50 | ug/l |
| Lead | <2 | ug/l |
| Mercury | <0.2 | ug/l |
| Alkalinity | <10.0 | mg/l |
| Total Hardness | <5.0 | mg/l |
| Chloride | <0.50 | mg/l |
| Sulfate | <2.0 | mg/l |
| Methylene chloride | 5 | ug/l |
| 1,1 - Dichloroethylene | <1 | ug/l |
| 1,1 - Dichloroethane | <0.5 | ug/l |
| Chloroform | <1 | ug/l |
| Carbon tetrachloride | <1 | ug/l |
| 1,2 - Dichloropropane | <1 | ug/l |
| Trichloroethylene (TCE) | <0.5 | ug/l |
| 1,1,2 - Trichloroethane | <1 | ug/l |
| Dibromochloromethane | <1 | ug/l |
| Tetrachloroethylene | <1 | ug/l |
| Chlorobenzene | <1 | ug/l |
| Trans-1,2-Dichloroethylene | <0.5 | ug/l |
| 1,2 - Dichloroethane | <1 | ug/l |
| 1,1,1 - Trichloroethane | <1 | ug/l |
| Bromodichloromethane | <1 | ug/l |
| Benzene | <1 | ug/l |
| Bromoform | <1 | ug/l |
| 1,1,2,2-Tetrachloroethane | <1 | ug/l |

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Kerry S. Saylor
Project Manager

2-14-89
Date

Donohue

U.S. Army Reserve

ATTN: Mr. Dave Voight

PROJECT NUMBER: 15977.007
COLLECTION DATA: Collected by Donohue
SAMPLE COLLECTED: 01-24-89
SAMPLE RECEIVED: 01-24-89

SAMPLE NO: 56875
DESCRIPTION: Field Blank

| | | |
|---------------------------|------|------|
| Toluene | <1 | ug/l |
| Ethylbenzene | <1 | ug/l |
| Vinyl chloride | <2 | ug/l |
| Total Xylene | <2 | ug/l |
| 1,2-Dichlorobenzene | <1 | ug/l |
| 1,3-Dichlorobenzene | <1 | ug/l |
| 1,4-Dichlorobenzene | <1 | ug/l |
| 2-Chloroethylvinyl Ether | <1 | ug/l |
| Cis-1,2-Dichloroethylene | <0.5 | ug/l |
| trans-1,3-dichloropropene | <1 | ug/l |
| cis-1,3-dichloropropene | <1 | ug/l |

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Project Manager

2-14-89
Date

Donohue

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ATTN: Mr. Dave Voight

PROJECT NUMBER: 15977.007
COLLECTION DATA: Collected by Donohue
SAMPLE COLLECTED: 01-24-89
SAMPLE RECEIVED: 01-24-89

SAMPLE NO: 56876
DESCRIPTION: Trip Blank

| | | |
|----------------------------|------|------|
| Methylene chloride | 6 | ug/l |
| 1,1 - Dichloroethylene | <1 | ug/l |
| 1,1 - Dichloroethane | <0.5 | ug/l |
| Chloroform | <1 | ug/l |
| Carbon tetrachloride | <1 | ug/l |
| 1,2 - Dichloropropane | <1 | ug/l |
| Trichloroethylene (TCE) | <0.5 | ug/l |
| 1,1,2 - Trichloroethane | <1 | ug/l |
| Dibromochloromethane | <1 | ug/l |
| Tetrachloroethylene | <1 | ug/l |
| Chlorobenzene | <1 | ug/l |
| Trans-1,2-Dichloroethylene | <0.5 | ug/l |
| 1,2 - Dichloroethane | <1 | ug/l |
| 1,1,1 - Trichloroethane | <1 | ug/l |
| Bromodichloromethane | <1 | ug/l |
| Benzene | <1 | ug/l |
| Bromoform | <1 | ug/l |
| 1,1,2,2-Tetrachloroethane | <1 | ug/l |
| Toluene | <1 | ug/l |
| Ethylbenzene | <1 | ug/l |
| Vinyl chloride | <2 | ug/l |
| Total Xylene | <2 | ug/l |
| 1,2-Dichlorobenzene | <1 | ug/l |
| 1,3-Dichlorobenzene | <1 | ug/l |
| 1,4-Dichlorobenzene | <1 | ug/l |
| 2-Chloroethylvinyl Ether | <1 | ug/l |
| Cis-1,2-Dichloroethylene | <0.5 | ug/l |
| trans-1,3-dichloropropene | <1 | ug/l |
| cis-1,3-dichloropropene | <1 | ug/l |

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Project Manager

Date

APPENDIX G

**WISCONSIN DNR GROUNDWATER MONITORING
WELL INSTALLATION FORM**

[illegible]